Pit and Quarry

With which is consolidated

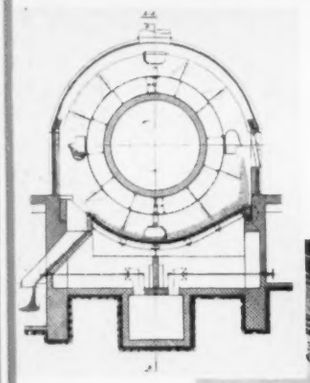
CEMENT-MILL & QUARRY

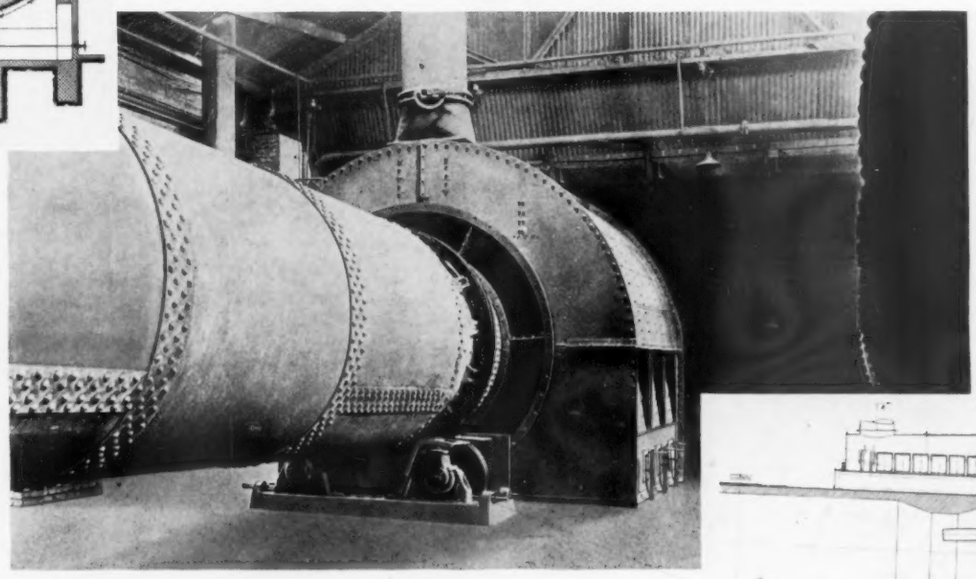
July, 1935

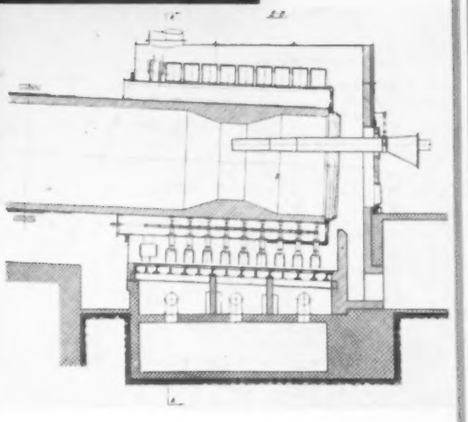
NRA U.S. CODE GRAPHIC ARTS INDUSTRY 1934

UNAX GRATE COOLER

AIR QUENCHING TYPE
INTEGRAL WITH KILN







Advantages

Rapid, efficient cooling of product.
Increase in fuel economy of the kiln.
Increase in grindability of clinker.
Improvement in quality of the cement.
Low first cost, low maintenance cost.

THE UNAX GRATE COOLER consists of two parts: one stationary, one revolving. The stationary part comprises a casing surrounding the outlet end of the kiln and containing a stationary grate. The revolving part consists mainly of conveying flights and scoops attached to and rotating with the kiln, spreading the clinker evenly over the grate, through which cooling air is passed. The heated air is used for combustion in the kiln.

The longest kilns in the world (512′ and 520′) are equipped with these Unax Grate Coolers.

★ Pages 21-25

F. L. SMIDTH & CO.

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TN1
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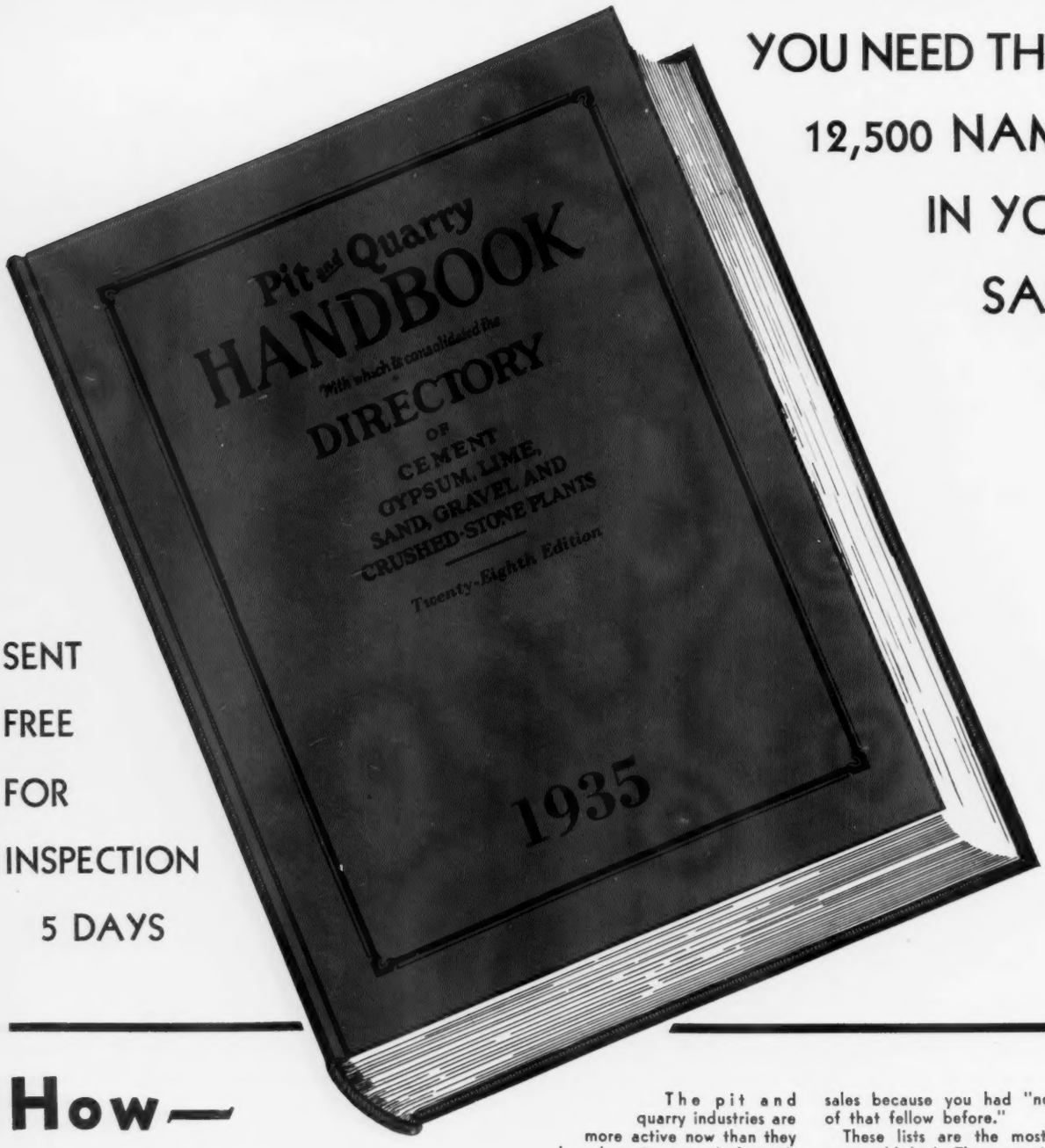
YOU NEED THESE 12,500 NAMES IN YOUR SALES KIT



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How—

—accurate and complete are your prospect lists?
—much "deadwood" is there on your prospect lists?
—much do you know about your prospects?
—much do you waste per year on poor lists?
—many "not there" calls do your men make?
—much do you know about new developments?

The pit and quarry industries are more active now than they have been in years. In fact, it's one of the most active fields in industry. It's natural. For before the roads, dams, bridges, buildings, etc., can be built under the public works program the raw material has to be furnished.

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These lists are the most complete ever published. They contain hundreds of new names. They have been completely revised—all listings have been brought up to the minute.

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Firm .....

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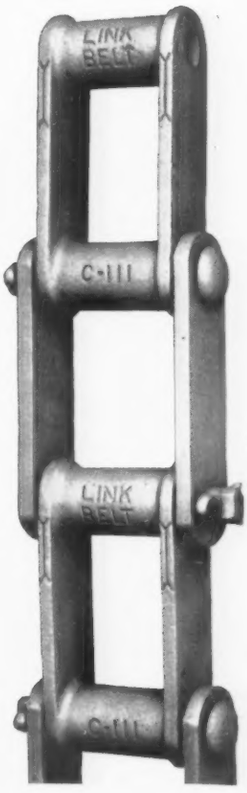
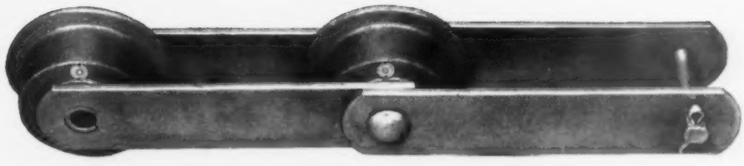
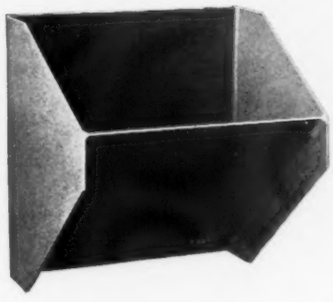
BUCKETS
for
MATERIALS HANDLING







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FOR smooth operation and long life with maintained efficiency—for real economy in the severest conveying and elevating service, use this wear-resisting combination.

Investigate Promal, the stronger, longer-wearing metal for chains and buckets. It lasts several times as long as malleable iron and costs but little more. Send for catalog.

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The Leading Manufacturer of Equipment for Handling Materials and Transmitting Power

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Pit and Quarry

With which is consolidated
CEMENT-MILL & QUARRY

Volume 28 JULY, 1935 Number 1

MEMBER AUDIT BUREAU OF CIRCULATIONS

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In This Issue

News of the Industry 21

Editorials 26
The Present Opportunity of Business—Toward Industry Integration

High-Early-Strength Cement Committee Rejects Proposed Standard 28

New Constant-Temperature Room Part of Volunteer Testing Equipment 31

Cement Industry Faces Serious Problems and Unusual Opportunities 34

The Present Status of Type B Cement After One Year's Experience 35

Lime Group Favors Voluntary Agreement to Preserve Code Benefits 39

Electrical Testing and Control Devices Reduce Cost of Purchased Power 46

Men of the Industry . . . 49
Personal Mention 50
Coming Events 50
New Incorporations . . . 50
Foreign Developments . . 51
Traffic News and Comment . 52
New Machinery and Supplies 53
Manufacturers' Publications 55

NRA U.S. CODE GRAPHIC ARTS INDUSTRY 1934

115 TIMES A MINUTE

WE HAMMERED THIS HOSE AGAINST CONCRETE

. . . on the "concrete beater" Goodyear Style M Air Hose shows slow, even wear . . . no cuts or tears

—and proved it would outlast others under abusive service

PICTURE an air hose carrying full working pressure pounding and scraping across a rough concrete block over one hundred times a minute. No field service is half that rigorous!

But that's how Goodyear engineers set about developing a hose that would stand the rough usage encountered in mines, quarries and other heavy duty jobs.

One of the biggest difficulties was the cover—for when the cover scrapes through, the body weakens and soon you get a burst.

The "concrete beater"

To duplicate severest field conditions Goodyear engineers rigged up a machine they called the "concrete beater"—a motor-driven shaft through which air pressure could be applied, mounted over a concrete slab.

Then they coupled all makes of hose to this shaft—sent them thump, thump, thumping against the rough rock at full speed—115 times a minute—until the cover failed and internal pressure caused a burst. And at first Goodyear hose didn't last any longer than the others!

So the engineers started over—spent weeks in perfecting a new heavy duck body of special weave—a new and extremely heavy cover of high tensile, abrasion-resisting stock—and put it on the beater.

Hour after hour this new hose hammered against the concrete—*33 to 200% longer than other makes before the cover failed. And in total service it lasted 60 to 70% longer before bursting. Here, at last, was a hose that could "take it."*

That is how Goodyear Style M Air Hose was developed, and the records for long-lived, trouble-free, economical service it has piled up on the nation's hardest jobs proves it as superior as these first tests indicated.

Individually specified by G T M

Whatever type Goodyear Hose you buy—air, steam, acid, oil, paint, water or gasoline—will give you the same outstanding service because it, likewise, is specially developed to meet actual service conditions, and because every length is individually specified to its particular job by the G. T. M.—Goodyear Technical Man.

Many industries entrust all their hose problems to this qualified expert—perhaps he could cut your costs, too. A line to Goodyear, Akron, Ohio, or Los Angeles, Cal.—or the nearest Goodyear Mechanical Rubber Goods Distributor—will put his wide experience at your disposal.

BELTS • MOLDED GOODS
HOSE • PACKING
MADE BY THE MAKERS OF GOODYEAR TIRES

THE GREATEST NAME IN RUBBER

GOODYEAR

"LAY-SET PREFORMED is the best closing line by a damn sight—*and you can quote me*"

Said this clam-shell bucket operator: (*Name on request*)

> "For 5 years we have used Lay-Set Preformed closing lines on this bucket—and I'll tell you that Lay-Set Preformed is the best closing line by a damn sight . . . and you can quote me."

"Just what do you mean?" we asked.

> "Just this," he replied: "We used to reeve *non*-preformed wire rope on this bucket. And the average service of such ropes was 10 weeks. *This* line—Lay-Set Preformed—gives an average of *12 months.* And believe me, mister, that's a lot of difference—especially when you have to stop and cut eight or ten feet off the end of the line and re-string your bucket. Believe me, I appreciate Lay-Set, and we're going to stick to it."

Lay-Set Preformed wire rope has been giving equally satisfactory service to wire rope users in every industry for years. If you are not getting the consistent, willing service of Lay-Set Preformed—write today for full particulars. We have an interesting booklet called "12 Burning Questions" which we will be glad to send you. Or, better still, we will send you a sample of Lay-Set with which you can prove for yourself just *why* Lay-Set Preformed lasts so much longer—gives so much greater service. Send for that sample and booklet—today.

HAZARD WIRE ROPE COMPANY, *Inc.*, Wilkes-Barre, Pennsylvania

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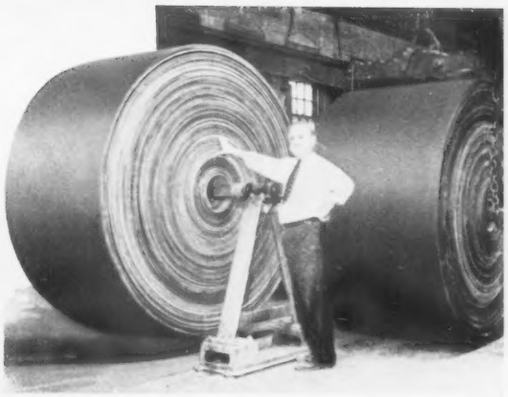
LAY·SET* *Preformed* Wire Rope

* PREFORMED ROPE IS MADE IN ALL TYPES, GRADES, CONSTRUCTIONS AND LAYS

Republic
CONVEYOR BELTING
WILL CARRY YOUR LOADS



AT LOWER COST PER TON

Republic has established an enviable reputation through its 34 years of experience in the design, manufacture and installation of conveyor belting. Many of the nation's largest producers of aggregates and crushed rock have been served by our cost cutting methods and by Republic's special belt constructions devised to meet unusual operating conditions.

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YOUNGSTOWN, OHIO

MECHANICAL RUBBER PRODUCTS FOR EVERY INDUSTRIAL REQUIREMENT

ORDER REPUBLIC RUBBER PRODUCTS FROM YOUR DISTRIBUTOR

BEHEMOTH, TAKE A BOW!

TOLEDO III

Owned by M. A. Breymann. Operates a 17-yard bucket for hard digging—a 28-yard bucket for soft digging. 150 feet in length—55-foot beam—12 feet from deck to bottom. Boom 85 feet long—10-foot boom sheave. Has largest main hoist rope ever built for this type of equipment!

BEHOLD the "Big Bertha" of dipper dredges—the mightiest dredge ever to dip below the waters of the earth. Operating under 50 feet of water through the steel muscles of **American Steel & Wire Company Tiger Brand Wire Rope**—it loads a 1500 yard scow in practically two hours—and doesn't even work a "sweat" up about it. When it came to selecting the right wire rope to engineer this giant—naturally the owners of this largest Dipper Dredge in the world turned to the builders of the largest selling wire rope in the world—**Tiger Brand Wire Rope.** Wherever dredges dip, derricks swing and weights suspend, you'll find this safer—more dependable—more economical wire rope operating in the thick of things. Facts—and full cooperation—await your inquiry.

LARGEST DIPPER DREDGE IN THE WORLD CHOOSES

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REPLACE or RECLAIM?

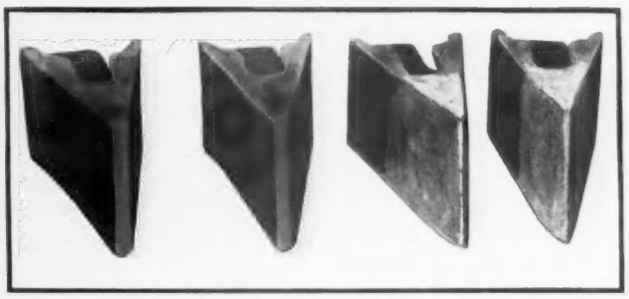
If it's gone beyond economical repair, scrap it and buy a new Amsco Manganese steel casting. If it's cracked or surface worn, repair it or build it up with Amsco welding rods.

AMSCO Nickel-Manganese Steel Welding Rods (U.S. Patent 1,815,464), originally made for our own use, are ideal for repair and reclamation welding. Use them for welding worn or fractured manganese steel castings and to give an air-toughening, work-hardening manganese steel weld to rolled or cast carbon steel.

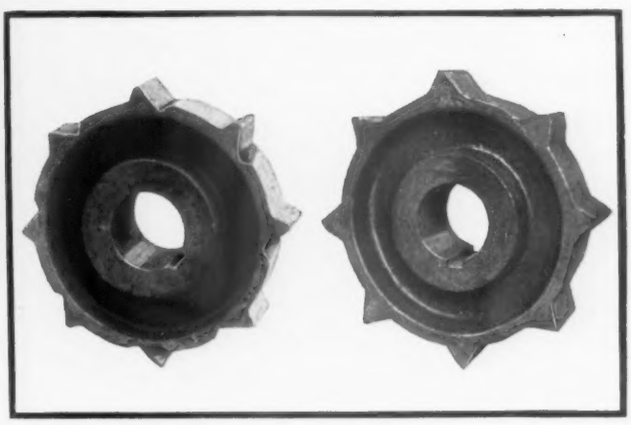
AMSCO No. 459 and No. 217 Hard Surfacing Rods, other exclusive products, are made for hard-facing parts subjected to severe abrasion such as Rolling Mill Guides, Pug Mill Knives, Dipper Teeth, Plow Shares, Screw Conveyor Edges, Pulverizer Hammers, etc. They are easily applied, extremely wear resistant and low in cost. They may be used to surface any ferrous article and also over a nickel manganese steel building up weld.

Users of AMSCO Welding Rods effect big savings in salvaging worn and broken equipment parts, savings frequently approaching 90% of replacement cost. Send for AMSCO Welding Rod Bulletins and confirmation data on the savings others are making!

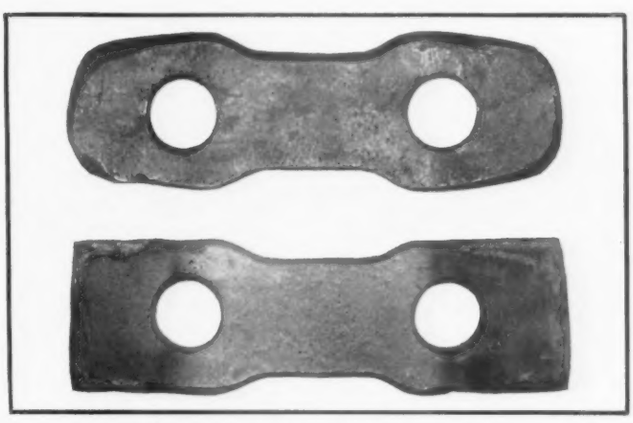
AMSCO Welding Rods are stocked by leading distributors and AMSCO foundries in all logical lengths and sizes, bare and coated.



AMSCO Manganese Steel Dipper Teeth before and after hard surfacing with #459 Rod.



Carbon steel crawler sprocket wheel. Worn and as built up with AMSCO Nickel Manganese Steel Rod.



Above, a worn pulverizer hammer. Below, built up with AMSCO Manganese Steel Welding Rod.

AMSCO # 217 Welding Rod, a new hard-facing rod, differs from AMSCO # 459 in giving a much harder deposit, although one that is not quite so tough. Use # 217 for maximum abrasion resistance where no great impact is involved.

If you have never used the AMSCO Rods —send for free samples.

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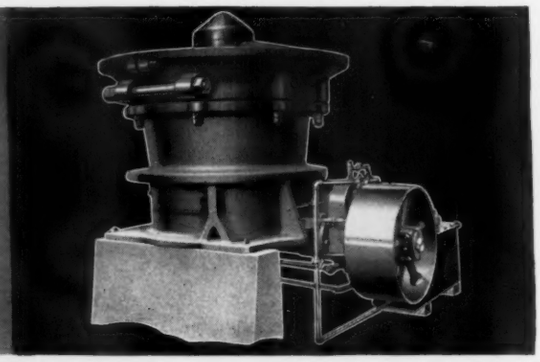
DESIGNED TO MEET TODAY'S CONDITIONS—*profitably*

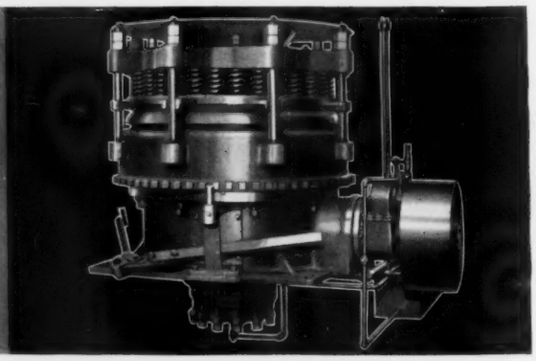
Modern in every sense of the word .... designed to enable you to meet today's conditions and operate at a profit .... this 3-piece combination of Telsmith equipment is a striking example of group efficiency.

PRIMARY BREAKER
FOR COARSE CRUSHING



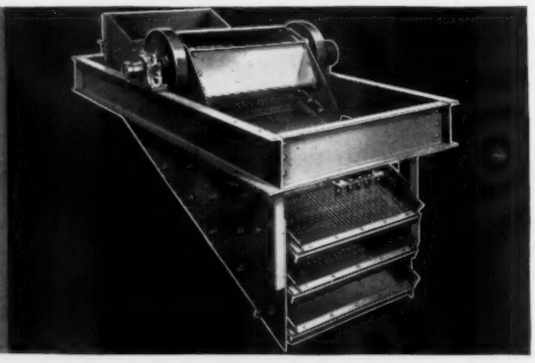
Has a fixed shaft and sleeve eccentric. Short, compact, with steel frame and steel crown, it is the outstanding performer on hard rock. Cut steel drive gears and force feed oiling permit higher eccentric speeds and faster gyration. Larger head and concave diameters, with greater receiving and crushing area, allow faster feeding. Parallel pinch starts immediately, crushes full tilt all way down; guarantees bigger capacity. Write for Bulletin B-15.

GYRASPHERE CRUSHER
FOR FINER CRUSHING



The Telsmith Gyrasphere takes the trouble out of secondary crushing. Working at choke feed, it turns out a bigger tonnage and more cubical product—crushes finer, with low power consumption and up-keep. The reasons—spring relief, rotary head support, spherical head, unit spring design, anti-friction thrust bearings, pressure lubrication, different distribution of crusher pressures. Write for Bulletin Y-15.

PULSATOR
FOR EFFICIENT SCREENING



The Telsmith Pulsator screens crushed rock, sand, gravel, ore or coal...wet or dry. Its circular movement produces a maximum screening action, uniform on every inch of the wire, on every deck, under any load. The toughest alloy steels, the finest anti-friction bearings and special labyrinth and piston ring steels (to protect working parts) give longer life and lower up-keep. Write for Bulletin V-15. M-2

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504 EAST CAPITOL DRIVE, MILWAUKEE, WIS.

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412 Westinghouse Bldg. . . . . Pittsburgh, Pa.
Choctaw C & M Co. . . . . Memphis, Tenn.

NEW! U.S. Super ROYAL CORD AIR HOSE *Built like a Tire*

1• The rubber tube is the finest quality oil resistant compound to combat the destructive effect of hot oil in the air line.

2• Each strand of cotton cord ply is laid in a rubber cushion to prevent contact with its neighboring ply. This prevents the rubbing and shearing action between the plies when the hose structure pulsates or expands under pressure—when subjected to constant flexing.

3• It will resist to far greater extent external blows or bruises caused by blasting, dropping tools on the hose or being run over by trucks—this because of its *unique* carcass structure.

4• It will resist greater pressures than the conventional type, of air hose.

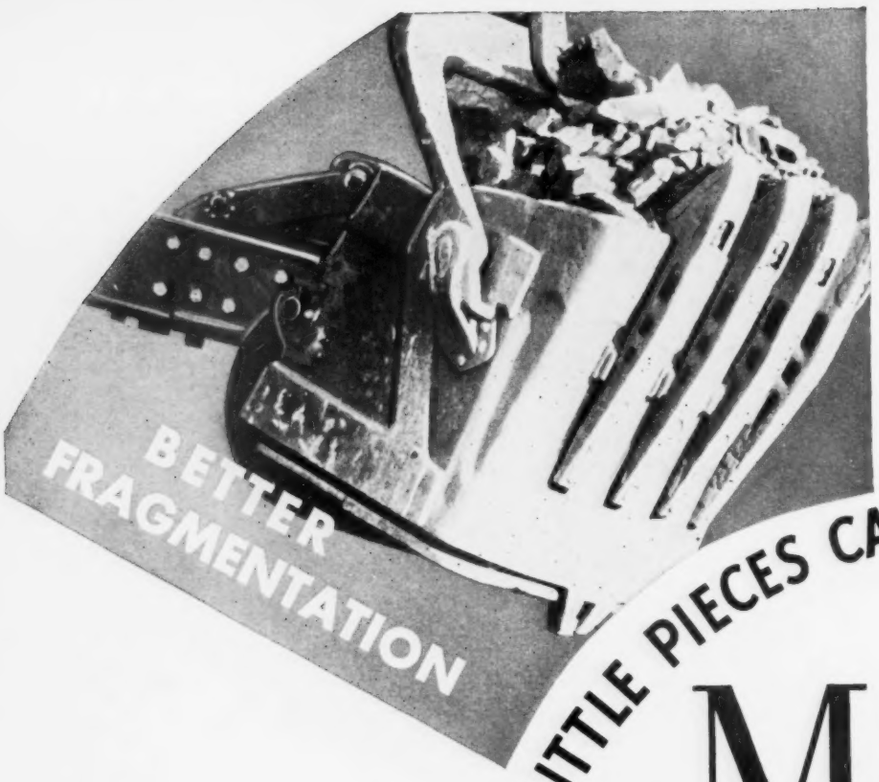
5• It is extremely flexible and consequently much easier to handle in actual service.

6• Its distinctive brown rubber cover will withstand maximum abrasion; will not peel off when cut or gouged, as has been conclusively proven by many tests simulating actual operating conditions.

Here's a new *kind* of air hose—new because it's actually built like a tire *to take punishment like a tire!* Extensive field tests prove conclusively the outstanding superiority of this hose over the conventional duck or braided ply construction.

Here, in short, is a new product of the world's largest producer of rubber to which we are proud to give our proudest name —U. S. Super Royal Cord. Write today for complete data—address United States Rubber Products, Inc., 1790 Broadway, New York

United States Rubber Company



LITTLE PIECES CAN MEAN . .

More Profit

THERE should be more profit for you when your shovels can keep on scooping up the little fellows, instead of trying to cope with big rocks. That is what we mean when we say that "Little Pieces can mean *more profit.*"

With Cordeau-Bickford Detonating Fuse, you can get little pieces—real pay dirt—from each charge. Each cartridge is, in effect, a primer cartridge because the line of Cordeau extends from the top to the bottom of the charge—detonates all cartridges completely and practically simultaneously.

Cordeau also permits the successive relief of burden, thus getting the maximum work and the best fragmentation from each row of holes. It has made the deep hole possible, has simplified loading operations and has made the giant blast both practical and profitable.

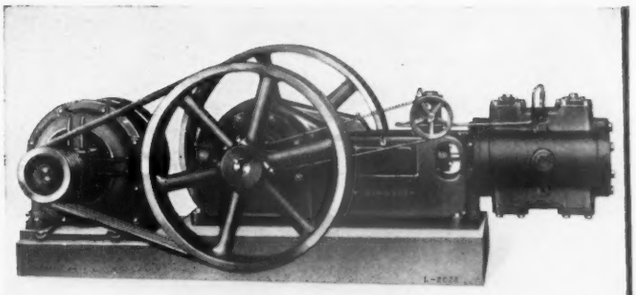
Increase your profits by getting more pay dirt. Cordeau will do it for you and pays well in four other ways, too! . . . Write us for full information. THE ENSIGN-BICKFORD COMPANY, Simsbury, Conn., *Established 1836.*

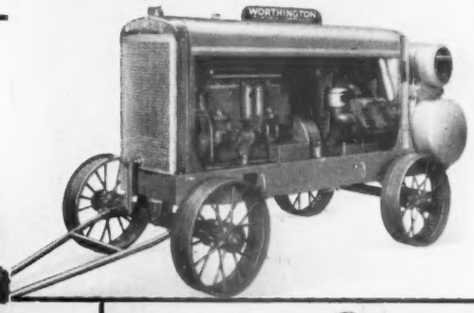
CORDEAU
DETONATING FUSE
BICKFORD
ALSO SAFETY FUSE *Since* 1836

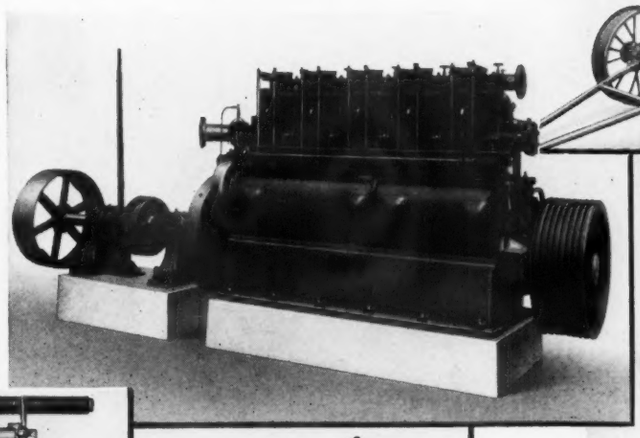
THE ENSIGN-BICKFORD COMPANY

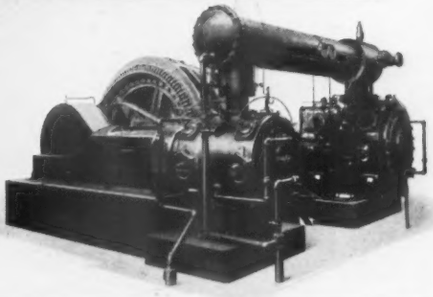
CB-44

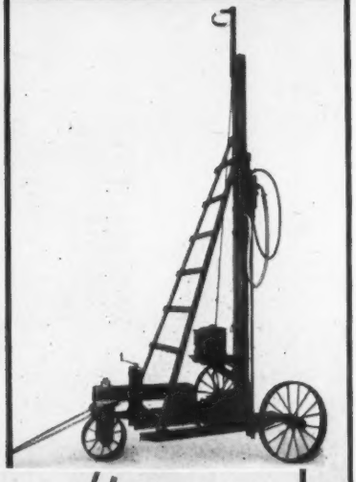
WORTHINGTON QUARRY EQUIPMENT

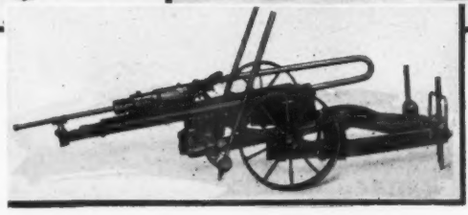












STATIONARY COMPRESSORS
for permanent installation in operation of quarries and mills

PORTABLE COMPRESSORS
for preliminary work in opening up new quarries

DIESEL AND GAS ENGINES
for driving the crushing plant

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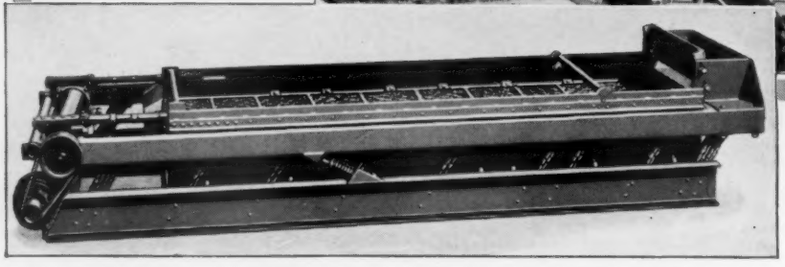

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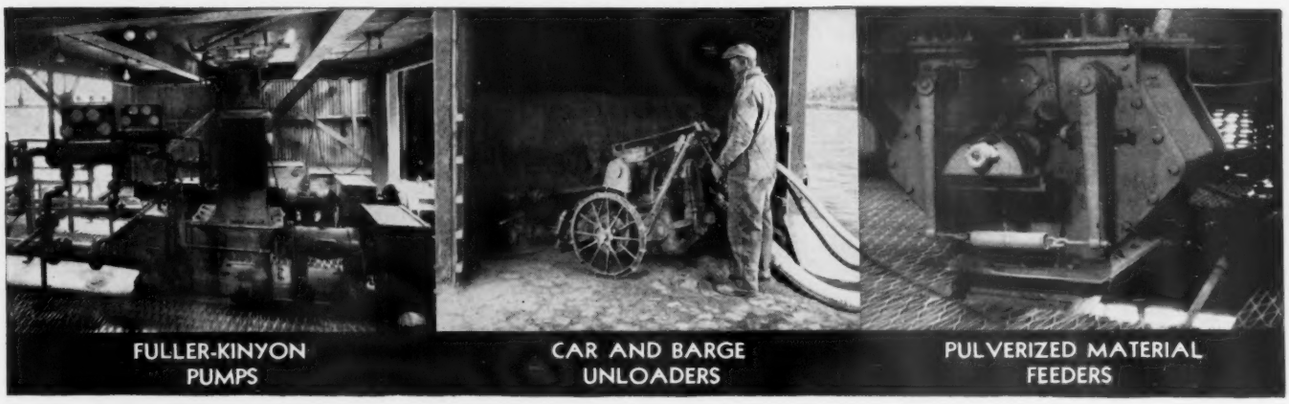

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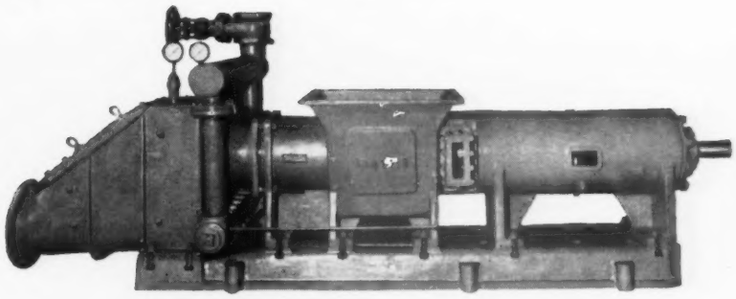

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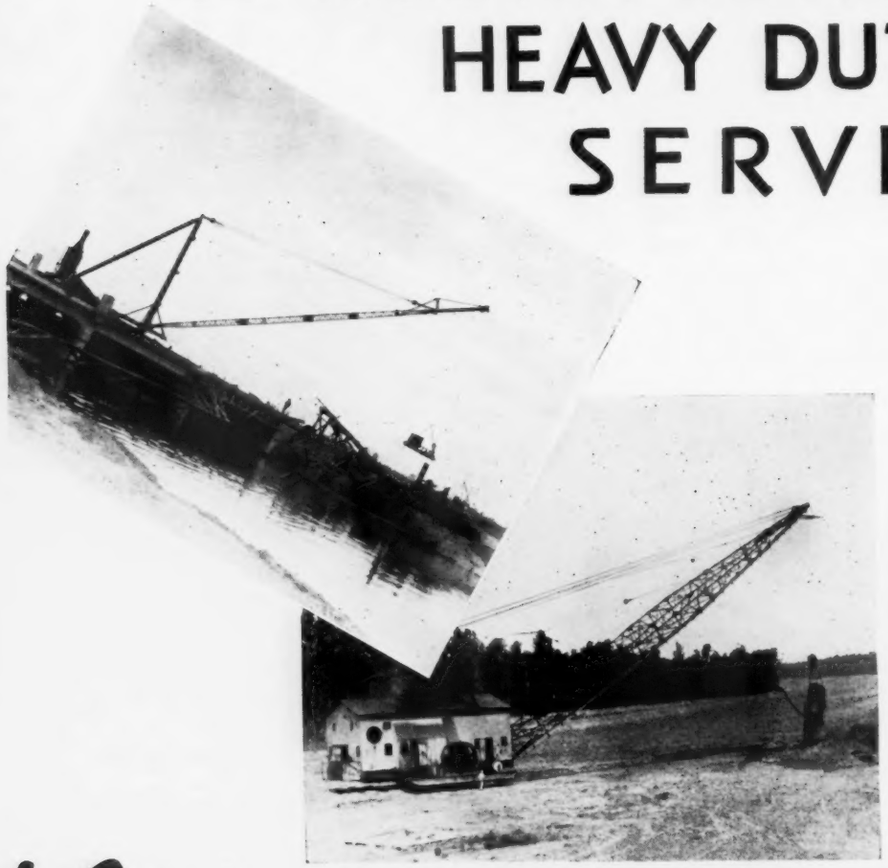

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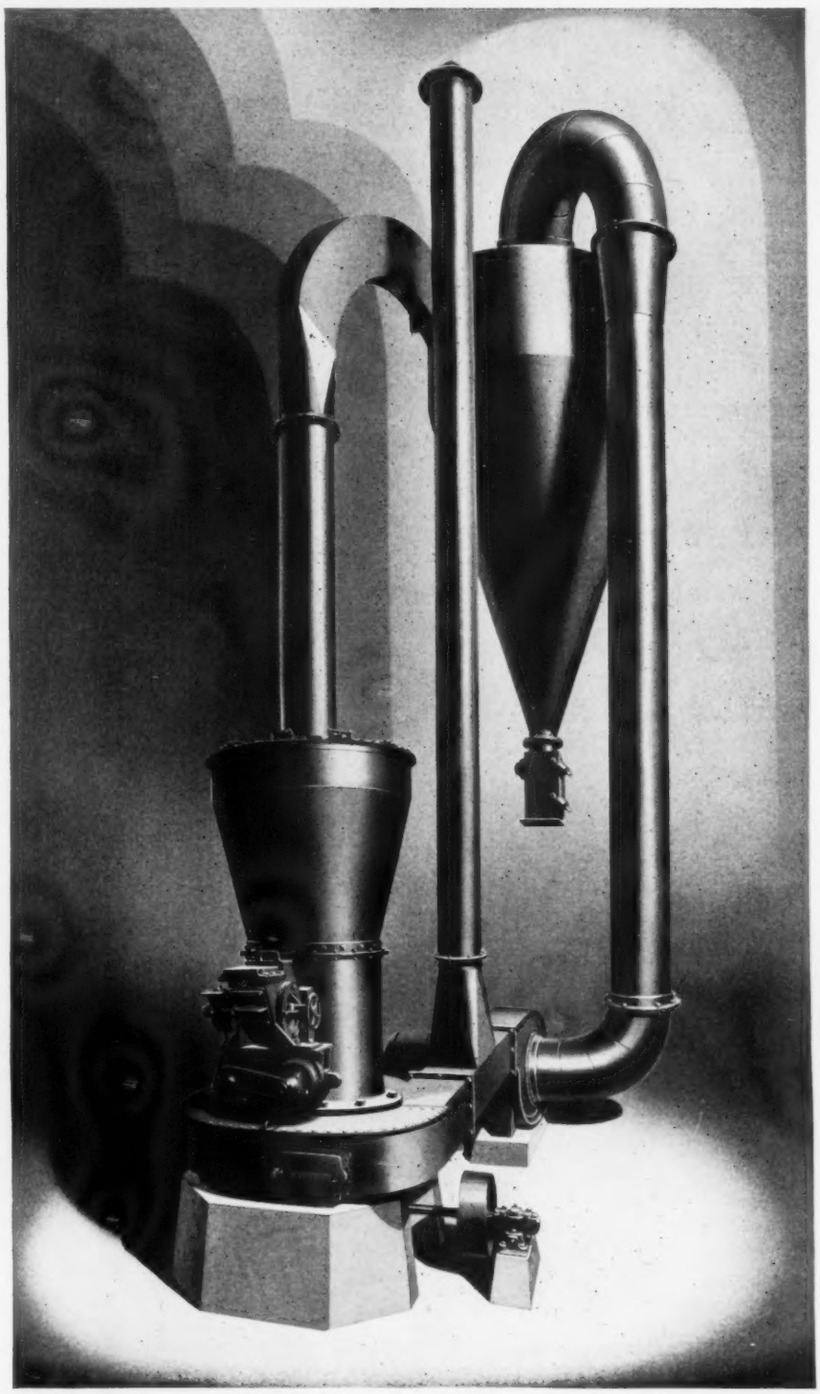

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For its size and output, the Midget shows a higher efficiency rating than any other type of mill. It is often substituted for other small grinding units with advantages of lower power cost, easier control and freedom from mechanical troubles.

It has no equal for economy in pulverizing limestone, gypsum, clay, coal and carbon products. Where these materials contain moisture, it may be operated as a Kiln Mill for drying and grinding at the same time. The following typical uses show its wide range of application.

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This sodium silico aluminate material is successfully ground by a Midget Mill, equipped with a whizzer separator, to a fineness of 99.4% passing 300-mesh at 1,300 pounds per hour.

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The Stone Industries. By Oliver Bowles, Supervising Engineer, Building Materials Section, United States Bureau of Mines. Covering the building-, decorative-, and crushed-stone industries in all their ramifications. It describes rocks and covers the geology and distribution of developed deposits in every state. It embraces the qualities of stones, their uses, methods of quarrying and manufacture, and marketing. Chapters are devoted to limestone, sandstone, granite, marble, slate, soapstone and foreign building and ornamental stones.

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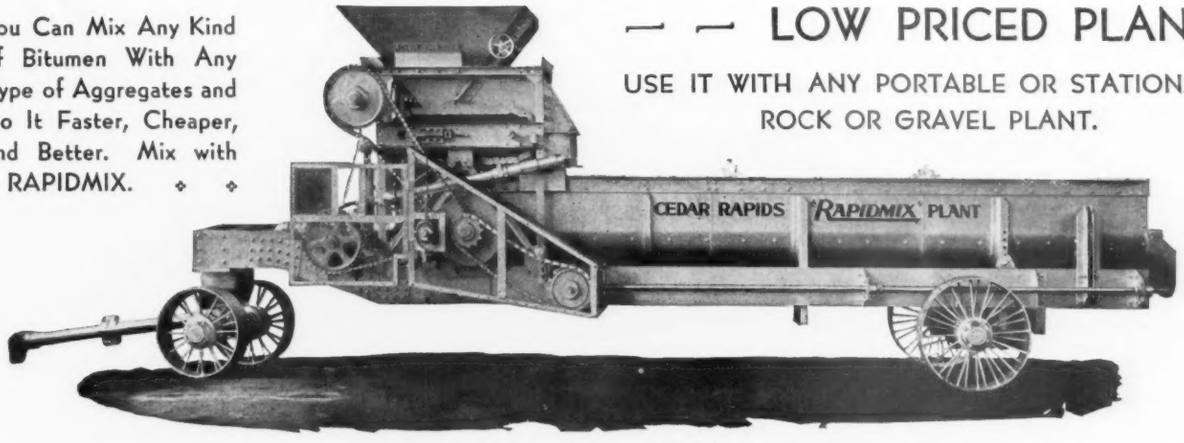

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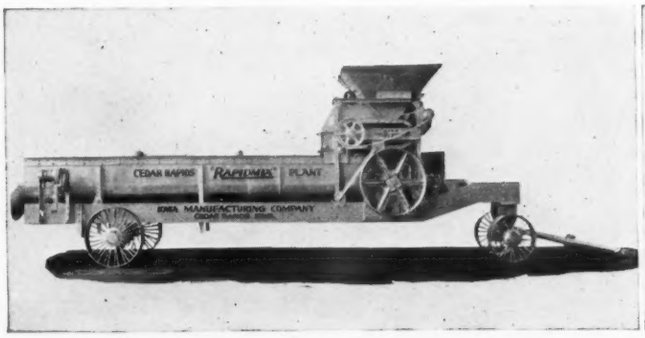
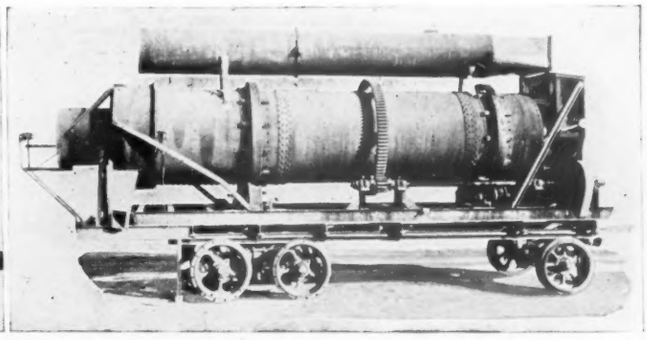


SIDE VIEW SHOWING DRIVES TO POWER PLANT



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NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION, INC.
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TO Advertising Managers, Sales Managers and Executives who sell products to Industrial America:

The 1935 convention of the National Industrial Advertisers Association will bring together in a single three day conference, the answers to many of the problems now confronting the manufacturer covering the advertising, merchandising and sale of industrial products.

The program, carefully planned and balanced by men who have devoted their careers to advertising and sales promotion, is practical, all embracing and highly instructive. It is advanced in the sense of being fully up-to-date but has due regard for established fundamentals.

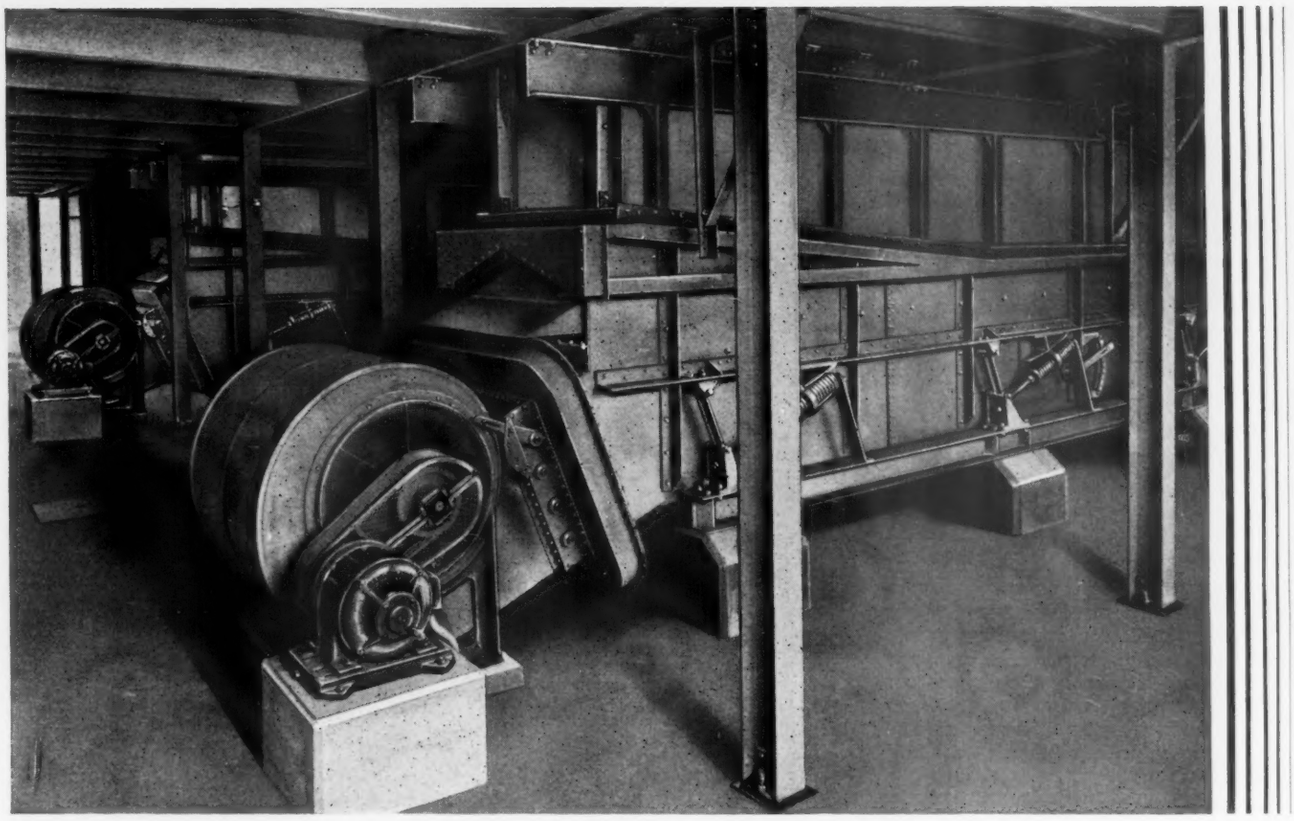
This program has been created for the executive who is advertising minded and uses advertising as a useful tool, as well as for the specialist who is highly skilled in his profession. Every one who attends this conference conscientiously will carry ideas away which he can profitably employ in his business . . . It is recommended very seriously to all thinking executives.

The conference will be held in Pittsburgh, Pa. September 18th, 19th and 20th at the William Penn Hotel. It is suggested that advance reservations be made through the secretary of the Industrial Advertising Council, P.O. Box 1198, Pittsburgh, Pa., to insure satisfactory accommodations.

Yours sincerely

NATIONAL INDUSTRIAL ADVERTISERS ASSN.

General Chairman,
1935 Pittsburgh Conference



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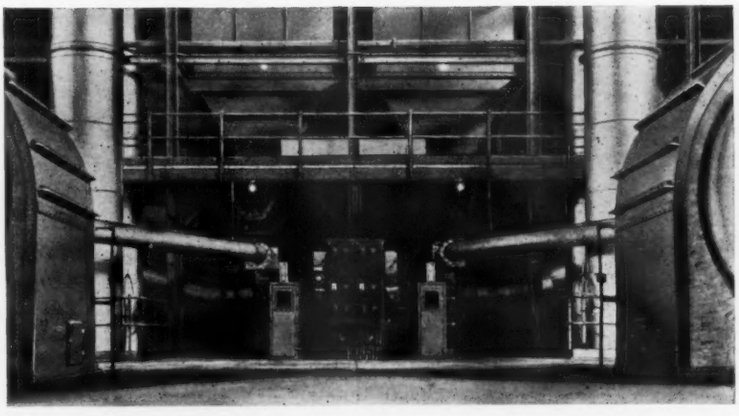
THE Allis-Chalmers Shaking Type Air Quenching Cooler has radical advantages over the usual rotary type. The clinker falls directly from the rotary kiln on to a shaking grate which forms a conveying surface. Cooling air from a duct below passing up through the agitated bed of hot clinker results in a very rapid exchange of heat from the clinker to the air. The recuperated heat is returned to the process with the primary and secondary air used for combustion in the kiln.



Installation of two 3'6" x 36' Air Quenching Clinker Coolers at Alpha Portland Cement Co., Alsen, N. Y. The larger illustration shows the feed end and the smaller the burning and control platform.

Besides cooling the clinker and saving fuel by recuperating most of the sensible heat, grinding costs are considerably reduced due to easier grindability of air quenching clinker. The cement produced has a more uniform and higher early strength. Power required to operate the shaking element of this new cooler and the fan for supplying cooling air, is considerably less than for a rotary cooler installation.

Nine Shaking Type Air Quenching coolers are in operation or under construction for installation in six different plants in this country and abroad.

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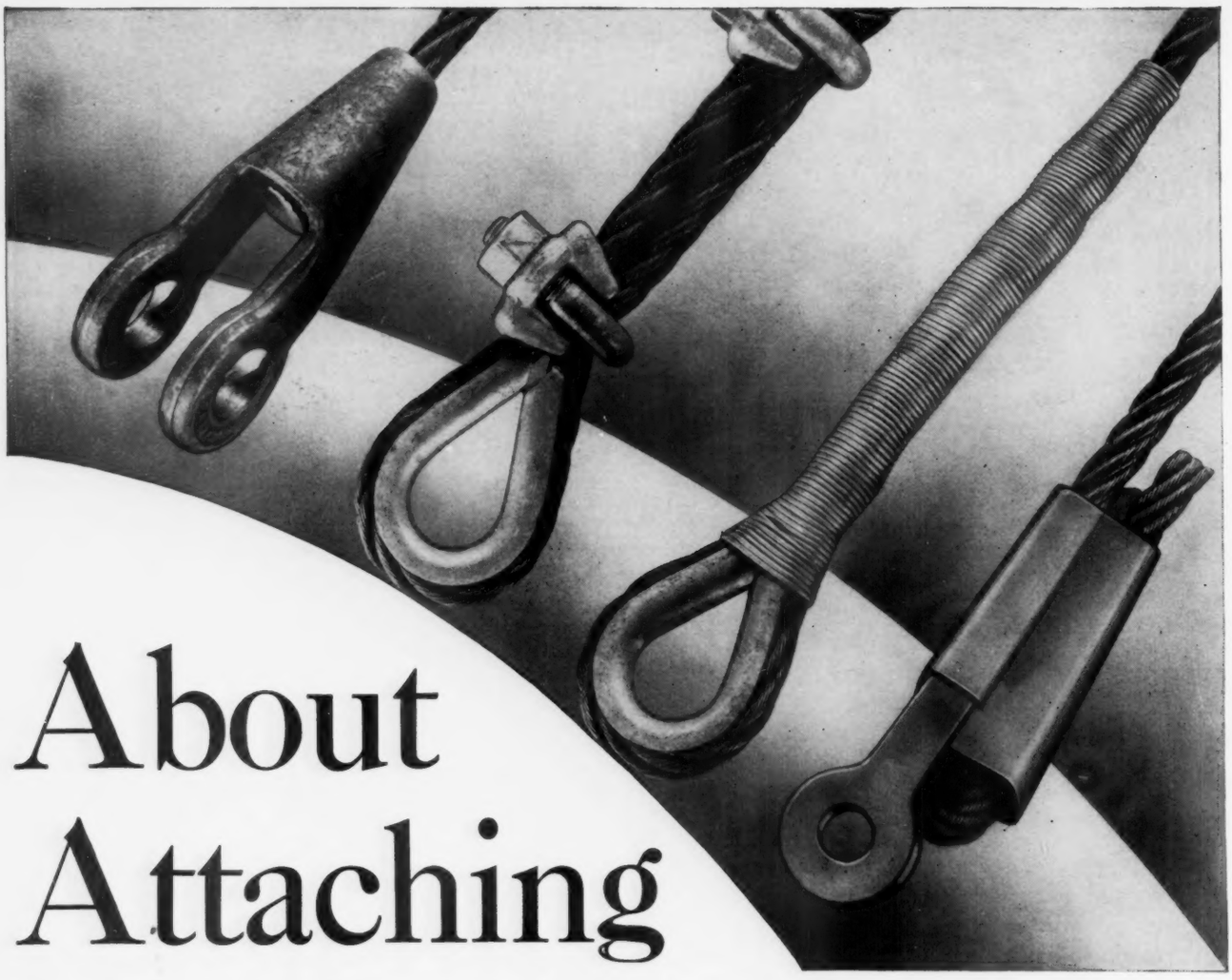

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Even though these attachments vary in strength from 80% to 100% of the full strength of the rope, there is a definite time and place when each may best be used irrespective of its decree of efficiency. Margin of safety, need for speed in making attachment, skill of men and facilities available are all factors. We would be glad to tell you the strength rating of each attachment, describe its advantages and limitations and tell you *where, when,* and *how* to use or not to use each. Write your request for this information.

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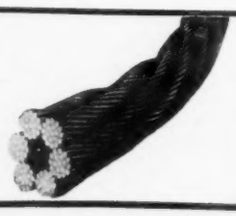
Wickwire Spencer manufactures all sizes and types of Wire Rope in standard lays and preformed. Wisscolay preformed wire rope will often solve a wire rope application difficulty. Ask our engineers where and when it should be used. Send for a free WIRE ROPE BOOK. *It will prove of great value.*



VOLUME 28 NUMBER 1

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

CHICAGO, JULY, 1935

May Building Nears Same Month of 1934

IS 2 PER CENT. OVER APRIL

Residential building awards continue to show encouraging improvement over the totals for 1934; the volume reported in the 37 eastern states during the initial half of June, amounting to $25,779,200, almost equalled the total reported for the full month of June, 1934. "Coming on top of a substantial improvement in May the current gain assumes even greater importance," says L. Seth Schnitman, Chief Statistician, F. W. Dodge Corp. The May residential contract total was about 6 per cent. greater than in April and about 80 per cent. ahead of the residential volume recorded for May, 1934.

Writing in the July Architectural Record, Mr. Schnitman states: "Because of continued expansion in activity in private as distinguished from public undertakings, the May contract total for all classes of construction was the largest thus far recorded for any month of 1935. Total construction awards in the 37 eastern states during May amounted to $126,718,600 as compared with $124,020,000 for April and $134,363,700 for May, 1934. Of the May, 1935 total, residential building amounted to $44,901,500 or about 35 per cent. In April the residential total was $42,202,800 while in May of last year residential awards were only $24,840,200, or less than 20 per cent. of all construction."

For the initial half of June, the F. W. Dodge Corp. reported non-residential building contracts of $22,292,200 as against $21,541,000 for the corresponding period of 1934; civil engineering projects undertaken during the first half of June totaled $18,466,800 as against $28,705,300 for the like period of last year. The figures for contracts covering all types of construction in the 37 eastern states amounted to $66,538,200 for the first half of June, an increase of about 5 per cent. over the total for the like period of last year.

For the elapsed portion of 1935 through June 15, total construction contracts amounted to $615,038,300 as against $790,574,900 for the corresponding portion of 1934. Of the major branches of the industry, only residential building was able to show a cumulative contract volume in excess of that recorded for 1934.

For residential building, contracts since the beginning of 1935 in the 37 eastern states amounted to $184,119,900, a gain of almost 60 per cent. over the total of only $118,464,800 for the period from January 1 through June 15, 1934.

Poidometers Added to Iola Plant's Equipment

★ The Lehigh Portland Cement Co. is reported to be installing four 20-in. by 4 ft. 6-in. Schaffer Poidometers in its plant at Iola, Kan. They are to be used for proportioning gypsum and clinker to finish grinding mills. Their variable speed motors will be connected to the variable-speed motor drive of the mills so that when the power required by the mills gets low the feed is automatically increased and *vice versa*.

Cement Plants Awarded 1934 Accident Trophies

The following plants have been awarded safety trophies by the Portland Cement Assn. for operating through the year 1934 without a lost time accident. The Ash Grove Portland Cement Co., Chanute, Kas.; the Southwestern Portland Cement Co., Victorville, Cal.; the Lone Star Cement Co. of Texas, Houston, Texas, and the Medusa Portland Cement Co., York, Pa.

Marquette Gets Large Federal Cement Order

The Marquette Cement Mfg. Co., Chicago, Ill., was awarded two government contracts, one for 400,000 sacks of cement for use in revetment work between Memphis and Cairo on a bid of $210,000 f.o.b., and the other for delivering the cement by barge at points at which it will be used.

★ The Universal Atlas Cement Co. has installed a Parsons Engineering Co. oval bag dust arrestor in its plant at Northampton, Pa.

Mineral Aggregates Institute Organized

WILL STUDY COMMON PROBLEMS

By unanimous vote of the boards of directors of the National Crushed Stone, the National Sand & Gravel and the National Slag Associations, which met in Chicago June 29 and 30, it was decided to create a Mineral Aggregates Institute for the purpose of presenting a united front and taking concerted action on all matters affecting the three associations. Through a governing board of six members—two chosen from each association — it is hoped to continue the effective work done by the now-disbanded Code Authority in its relations with the Federal government and to protect the interests of the three industries in freight-rate proposals and other matters of mutual concern.

At separate meetings of the three boards two members of each were elected to a conference committee which was instructed to bring in a plan for coöperative action. Representing the crushed stone association were H. E. Rodes and Stirling Tomkins; representing the sand-and-gravel association, W. H. Klein and H. V. Owens; and representing the slag association, W. E. Bliss and C. L. McKenzie.

About the middle of June, Otho M. Graves, chairman of the executive council of the old Code Authority, submitted by letter to the three industries three proposed plans for future action by the associations looking toward some type of coöperative effort in matters of common interest. The first, designated as Plan A, contemplated the dissolution of the present organizations and the formation of a Mineral Aggregates Assn. in their stead, each industry to be represented by a vice-president and executive committee "for the promotion of its competitive relationships." The second plan, B, provided for the formation of an institute composed of the executive committees of the three associations. Under C, the third plan, the three associations would have been left as they were, "without a common administrative agency, but free to coöperate on matters of mutual interest when, and to such extent as, each association for

itself may deem advisable." The replies received to the questionnaires sent to members of the three industries showed much difference of opinion and, because of the limited response, did not apparently reflect industry opinion with much accuracy, it was felt. The conference committee placed before a joint meeting of the three boards the following plan which was adopted:

(1) There shall be organized The Mineral Aggregates Institute, the members of which shall be the National Crushed Stone Assn., the National Sand & Gravel Assn., and the National Slag Assn. Each of the three member associations shall maintain its present organization and separate identity.

(2) There shall be a Governing Board of six, two of whom shall be chosen by each of the three member associations.

(3) The Governing Board shall elect a President from its membership, and an executive secretary and treasurer from the paid staffs of the member associations. The president and other members of the Governing Board shall serve without compensation.

(4) The first duty of the executive secretary and of the treasurer shall be to the institute which shall reimburse the member associations for salaries of the executive secretary, the treasurer and other association employees in proportion to the time devoted by them to institute affairs, and for such other expenses as may be incurred by the member associations in the conduct of institute business.

(5) The expense of the institute shall be divided among the three member associations in proportion to the tonnage or dollar value of the production of each.

(6) The duties of the Mineral Aggregates Institute as administered by its Governing Board shall be to consider and act upon matters commonly affecting the interests of the three member associations. These shall include national legislative and governmental relations, important freight-rate proposals, and such other matters of common interest as the governing body by unanimous consent may determine.

(7) Subject to the approval of the three member associations the Governing Board shall adopt rules and regulations for the conduct of the business of the institute.

At separate board meetings the following members of each association were chosen to serve on the Governing Board of the institute. For the crushed-stone association Otho M. Graves and Russell Rarey, for the sand-and-gravel association H. V. Owens and Alexander Foster, Jr., and for the slag association C. L. McKenzie and H. N. Snyder. The Governing Board met and elected Otho M. Graves chairman, V. P. Ahearn executive secretary, and J. R. Boyd treasurer.

Among matters of general interest which came before the separate boards was the progress report of the sand-and-gravel association's Committee on Governmental Competition. The report, presented by Chairman E. Guy Sutton, may be summarized by quoting a few of the observations and recommendations. The following contributing causes were listed by Mr. Sutton's report:

1. The growing tendency of divisions of government, both federal and state, to invade private enterprise.

2. The encouragement by the bureau of Public Roads in the promotion of low-type gravel roads for secondary highways which may be constructed cheaply with poorly-graded and unprocessed aggregates secured from wayside pits.

3. The evolution of the large motor truck as a highly suitable vehicle for the transportation of sand and gravel for comparatively long distances.

4. The maintenance by the railroads of a high level of freight rates on mineral aggregates.

5. The activity of machinery manufacturers in promoting the sale to governmental agencies of portable equipment that has been developed to a fairly high state of efficiency especially for the production of materials under tax specifications.

6. The production of the products of our industry by county and township units as a means of relieving unemployment locally.

7. The gross misconception of the cost of production and the fine opportunity presented for governmental units to cover up or submerge many items of cost.

The following comments on these factors were presented:

1. By uniting our efforts with other industries and professions that are facing a like condition, it should be possible to curb the tendency of the governmental agencies to invade the province of industry. A stubborn obstacle to overcome in that connection is the persistence of governmental employees to perpetuate their jobs and to build up political power, especially in rural communities.

2. The development of the truck denotes progress in transportation facilities and can not be forestalled even if we so desired.

3. The railroads in many sections of the country are reducing freight rates to meet individual situations, which might be recommended as a better plan for countrywide adoption than to seek general reduction in rates.

4. At the present time it seems to be more alluring to the manufacturer of sand-and-gravel machinery to push the sale of portable equipment rather than equipment for permanent plants, and it is doubtful whether anything can be done about it since we can have no control over another field of commercial activity.

5. It should be easy to persuade the Bureau of Public Roads as well as the various state highway departments that have followed the lead of that bureau, that low types of highway construction, for example, the so-called stabilized road, conceived and fostered by the producers of calcium chloride, is not meeting the demand for suitable secondary highways and that the political subdivisions and consequently the taxpayers are not getting adequate value for the money invested in the building of such types of roads.

6. As to relieving unemployment, it should be apparent to any division of government that any effort to provide temporary employment for a few men locally deprives other employees of work that might be more permanent in character.

Mr. Sutton advocated the institution of an active campaign "for the adoption of highly-restrictive specifications to apply on our materials by all highway departments, including the Bureau of Public Roads. This method," he said, "has the sound reason of assuring the construction of better highways to the advantage of the taxpayers and the traveling public." Mr. Sutton added that "the tightening of specifications might involve some revamping in plant facilities but that would be of slight importance as compared to the alarming loss of business that permanent plants are experiencing because of the steady increase in governmental production. This manner of solving the problem has been highly effective in one state to the extent that not only have governmental units ceased the production of our materials but the so-called irresponsible portable or fly-by-night producers have had to seek other territory . . ."

The industrial-sand producers were by unanimous consent admitted to membership as a division of the National Sand & Gravel Assn.

At the last separate meeting of the National Crushed Stone Assn. board Otho M. Graves was unanimously elected an honorary member. This action was taken in recognition of the fact that the dissolution of the Code Authority no longer imposed on him the regard of propriety and impartiality which had induced him to resign from the board when he assumed the chairmanship of the Code Authority in 1933.

The last joint meeting of the three boards adopted a resolution condemning the government's regulations limiting the amount of money to be spent per year per man under the $4,800,000 works program as effectively nullifying the announced objective of that plan, which was the recovery of business and particularly of the durable-goods industries.

California Legislature Repeals Turner Law

STATE CAN CHOOSE ROAD TYPES

The California state legislature has passed the Difani bill repealing the Turner bill which has been law for almost two years. The Turner bill is said to have hampered cement producers considerably as it required the state to call for bids on both cement and asphaltic concretes for highway paving and to take the lowest bid without regard for the suitability of the material to the individual project. Repeal of the bill means that the state can choose first the type of construction and then call for bids on that type. The cement industry will now be able to sell cement concrete paving material on its merits of durability for use in places where highways are subjected to heavy traffic or where heavily reinforced paving is desired.

Midwestern Lime Makers Vote to Hold Code Gains

Guided by the action taken by members of the National Lime Assn. at the Hot Springs convention, lime makers in Districts 7 and 12 met in Chicago June 28 and set up a temporary committee to continue voluntarily the practices with which manufacturers in these districts compiled under the N.R.A. code. A resolution supplementing the "declaration of policy" approved by the convention was adopted.

★ The United States Gypsum Co. of Chicago, Ill., has purchased a Schaffer Poidometer for use at one of its plants.

Universal Atlas Wins No-Accident Trophy

FOLLOWS TEN YEARS' STRIVING

Hundreds of persons—employees, members of their families and other guests—participated in a spectacular trophy-dedication ceremony of the Universal Atlas Cement Co. on June 27. The Buffington, Ind., plant was awarded the Portland Cement Assn. trophy for having gone through 1934 without experiencing a single lost-time accident. In fact, the plant had had no such accident in 842 days up to that date and is striving to keep the record perfect for at least 1,000 days in order to win further recognition.

The chief speaker was Gov. Paul V. McNutt of Indiana, who pleased those assembled by announcing that there would be no diversion of gasoline taxes and motor-vehicle fees to other than highway purposes in his state. Of the 4c. per gal. tax on fuel, 2c. will go to the state and 2c. to counties and municipalities, all for highway work.

Both B. F. Affleck, president of the cement company, and A. H. Young, vice-president of the United States Steel Co. of which the Universal Atlas concern is a subsidiary, delivered interesting and appropriate addresses. Mr. Young reminded his audience that the theory that accidents are preventable is not more than about thirty years old. He said that the birth of organized accident-prevention was due to the joint work of Capt. Ben Smith of the Joliet works of the Illinois Steel Co. and Robert J. Young, safety inspector there, which they began in 1905. In his opinion the safety movement was started for humanitarian reasons rather than for economic reasons, although it has brought financial gains to employers and employees.

J. H. Kempster, general superintendent of the Buffington plant, made the address of welcome. The trophy was presented by E. J. Mehren, president of the Portland Cement Assn., and was accepted on behalf of the cement company and its employees by C. B. McConnell of the Buffington organization. Preceding the unveiling of the trophy there was a flag-raising ceremony conducted by the Gary Post of the American Legion, the musical numbers on the program being played by the Gary Municipal Band.

Before the ceremonies began visitors were taken on an inspection trip through the plant and at their conclusion were given a buffet supper as guests of the company. All the arrangements were made by committees of the plant workers, who, spurred on by a ten-year effort to win the trophy, produced a program that appropriately celebrated the winning of this formal recognition.

Above.—President Affleck of Universal Atlas addressing the trophy-dedication crowd. *Center, top.*—The trophy just after the unveiling.

Lime Makers Continue to Comply With Code

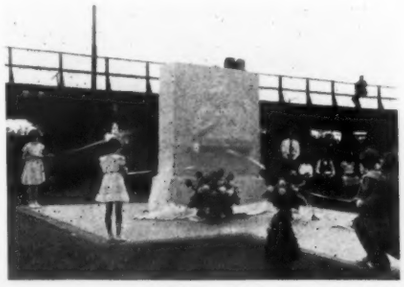
Lime manufacturers of the Fourth District, consisting of Virginia, North Carolina and South Carolina, met at Harrisonburg, Va., on May 29 and unanimously voted to adopt a resolution to retain in their business all the provisions of the NRA lime code so far as is permissible under the recent Supreme Court decision. After adopting the resolution the following telegram was sent to President Roosevelt:

"The lime manufacturers of the Fourth District, consisting of Virginia, North Carolina and South Carolina, all of whom have been operating under the code of fair competition for the lime industry, ninety per cent. of whom by production and individual plants are assembled to-day in Harrisonburg, Va., have unanimously adopted a resolution expressing confidence in you to continue your efforts in behalf of the industry and its employees and assure you that this group of manufacturers composed almost entirely of small enterprises, have resolved to comply voluntarily with all provisions of the lime code insofar as the same is permissible under the recent decision of the Supreme Court and until the Congress has had time and full and ample opportunity to enact further legislation looking to the perpetuation of at least the vital benefits derived by the lime industry, its producers and employees, under the code of fair competition in effect during the last twenty months."

By direction of the lime manufacturers of the fourth district,

HAL S. COVERT, Secy.

★ The North American Cement Corp., Security, Md., has installed a Traylor apron feeder and a new hoist in its rock-crushing department.



Aggregates Producers Form One Trade Body

SEEK CO-OPERATIVE ACTION

At a recent meeting of Ohio producers of crushed stone, sand and gravel and slag in Columbus the Ohio Mineral Aggregates Assn. was formed. The purposes of the organization, as outlined in the constitution, are "to secure coöperative action among producers of crushed stone, sand and gravel, and slag; to improve standards of labor, stabilize employment, and maintain fair trade practices; to promote by all proper means the use of mineral aggregates, especially in highway construction; to inform the public concerning the economic advantage in the use of said materials; to contact state and county engineers and township authorities with the object of securing a larger use of these products; to keep its members informed concerning the activities of the state and local highway authorities, the amount of available highway funds, and the manner in which such funds are being expended; to inform producers concerning proposed legislative measures affecting these industries; to support desirable legislation and to oppose objectionable measures, such as the diversion of highway revenues to non-highway uses; to interest itself in transportation schedules which affect the industries as a whole; to promote coöperation among members by bringing them together for round-table discussion; and in general to perform all the duties and services of a trade association for the industries."

A board of 23 directors—9 from the crushed-stone industry, 9 from the sand-and-gravel industry, and 5 from the slag industry—was elected, and at the coming organization meeting of that board a president, secretary, treasurer and other administrative officers will be chosen.

★ The Hawarden Gravel Co., of Hawarden, Ia., has installed a Universal straight line 824 crusher and screen plant. A Barber Greene 24-inch conveyor has also been installed.

Above.—The Carl D. Bradley loaded with limestone for the Buffington plant. *Center, bottom.*—Part of the plant which won the trophy.

Quarry Employment Gains 9.4% in May

CEMENT INDEX RISES 15.4%

The upward swing in employment, which began in February, has continued through March, April and May.

In the quarrying industry the employment index rose from 37.3 in February to 49.5 in May, showing increases of 8.7 in March, 11.8 per cent. in April and 9.4 per cent. in May. In May reports from 1,094 quarries showed 32,631 workers employed—a 9.4-per cent. increase over the April figure of 29,832 and a one-week pay-roll of $547,947—a 13.5-per cent. increase over the $482,737 of April. Per-capita weekly earnings rose from $15.60 in March to $16.08 in April, a gain of 15.9 per cent. The average hours worked per week increased 1.8 per cent. in the same time from 32.8 to 33.5, while average hourly earnings

EMPLOYMENT AND PAY-ROLLS IN THE QUARRYING AND CEMENT INDUSTRIES, BY MONTHS

Mo.	Quarrying and Nonmetallic Mining			Cement		
	Plants Reporting	Employees	One-Week Pay-Roll	Plants Reporting	Employees	One-Week Pay-Roll
Feb.	1,091	25,422	$384,759	135	13,765	$241,172
Mar.	1,091	27,646	431,314	135	15,129	273,147
Change		+8.7%	+12.1%		+9.9%	+13.3%
Mar.	1,127	27,314	423,865	140	15,133	275,114
Apr.	1,127	30,549	491,284	140	18,200	350,957
Change		+11.8%	+15.9%		+20.3%	+27.6%
Apr.	1,094	29,832	482,737	140	18,357	350,468
May.	1,094	32,631	547,947	140	20,942	404,344
Change		+9.4%	+13.5%		+14.1%	+15.4%

rose slightly from 47.5 to 47.9 c. There were no changes in wage rates in March, but there were increases in 4 plants affecting 203 workers in April.

The employment index in the cement industry rose from 37.8 in February to 57.0 in May, showing gains of 9.9 per cent. in March, 20.1 per cent. in April and 15.4 per cent. in May. Reports from 140 plants in May showed 20,942 employees as compared with 18,357 in April—a gain of 14.1 per cent.—and a one-week pay-roll of $404,344 as compared with $350,468 in April—an increase of 15.4 per cent. Per-capita weekly earnings rose from $18.05 in March to $19.28 in April, an increase of 6.1 per cent. The average hours worked per week rose from 31.5 in April to 34.1 in May, a gain of 7.9 per cent. The average hourly earnings, which were 57.3 c. in April, were 56.7 c. in May, a decline of 1.4 per cent. There were no changes in the wage rates in either month.

Pennsylvania Producer Rebuilds Crushing Plant

★ The Thomasville Stone & Lime Co., Thomasville, Pa., is completing a rebuilding program started in November, 1934. This involved the rebuilding of the entire crushing and grinding plant and the replacement of line shaft drives with individual electric motors. New equipment installed included a Link-Belt pan conveyor, speed reducer, etc. The 14 vertical kilns are now being rebuilt with four firing doors instead of the former two.

Over $90,000,000 Lent for FHA Modernization

According to Acting Administrator Stewart McDonald of the Federal Housing Administration much has been accomplished by this body since President Roosevelt signed the National Housing Act on June 27, 1934. Mr. McDonald pointed out that not only was it necessary to provide for recovery of the building industry but the correction of certain conditions that contributed to its former desperate situation was also necessary. Among the obstacles confronting this movement were the task of creating an efficient organization, the necessity of obtaining the coöperation of private financial institutions, familiarizing the public with the program, new legislation in 43 states to permit complete operation of the insured mortgage plan, etc.

In spite of all these obstacles, said Mr. McDonald, the program has been highly successful. In a year's time personal calls have been made on 9,000,000 homes; nearly 2,000,000 pledges for modernization jobs have resulted, and the coöperation of 13,000 financial institutions has been secured. Over $90,000,000 in loans for repair and modernization of buildings have been insured and many times that amount in cash work has resulted from this program. Losses on these loans have been negligible and applications for insured mortgages now total more than $1,000,000 daily.

$1,250,000 in Silicosis Damage Suits Settled

Sixty-eight silicosis damage suits totaling approximately $1,250,000 filed against the Missouri Portland Cement Co., St. Louis, Mo., by former employees, were dismissed by the court. The dismissal of the suits was made upon stipulation of the attorneys after settlements were made out of court. The former employees of the company, who had brought the suits, had been employed at the firm's plant at Prospect Hill, St. Louis County. They alleged they contracted silicosis and other occupational diseases because of the negligence of the company to provide proper safeguards. Court costs were paid by the cement company upon dismissal of the suits.

★ The Consolidated Feldspar Corp., is installing in its plant at Erwin, Tenn., 8 Exolon magnetic separators made by the Separations Engineering Corp. Earlier in the year three Jeffrey-Traylor electric vibrating screens and a Tyler 400 electric screen were installed.

PWA Material Orders Reach $215,959,192

CEMENT TOTALS $105,238,197

During the 18 months ended April 15 there was spent for nonmetallic minerals and their products to be used on Public Works Administration projects a total of $215,959,192. The expenditures for the month ended April 15 were $7,661,540. The detailed figures are given in the accompanying table.

NONMETALLIC MINERALS AND THEIR PRODUCTS PURCHASED FOR PUBLIC-WORKS PROJECTS

Material	Value of Material Orders Placed	
	During Month Ended April 15, 1935	Total (18 months) From Beginning to April 15, 1934
Cement	$3,353,892	$105,238,197
Crushed stone	1,166,079	29,203,762
Sand and gravel	1,886,834	50,020,720
Lime	1,836	171,740
Marble, granite, slate and other stone products	457,545	12,977,740
Concrete products	24,528	542,183
Glass	60,345	723,413
Paving materials and mixtures	386,924	12,356,371
Roofing, asphalt shingles, etc	159,804	2,446,180
Wall plaster, wallboard, etc	163,147	2,109,890
Asbestos	460	66,027
Minerals and earths ground or otherwise treated	146	102,969
Totals	$7,661,540	$215,959,192

Cement heads the list with an expenditure of $3,353,892 for the month and $105,238,197 for the year and one-half. Sand and gravel rank second with $1,886,834 for the month and $50,020,720 for the entire period. Third place is held by crushed stone, for which $1,166,029 was spent in the month and $29,203,762 in the 18 months. Over eighty-five per cent., or $184,462,679, of the $215,959,192 spent for all the materials listed was expended for cement, crushed stone and sand and gravel, and of the $184,462,679 mentioned over 57 per cent. went for cement, over 21 per cent. for sand and gravel and more than 15 per cent. for crushed stone.

California Producers Will Follow NRA Code

Officials of the Rock, Sand and Gravel Industry of Northern California announced their intention to abide by provisions of the code of fair competition established by the now defunct NRA. The same schedule of wages, hours and working conditions that were required under the code will remain in effect.

★ The Sicily Island Sand & Gravel Co., a new company, is building a sand and gravel plant at Sicily Island, La. The plant, when completed, will have a daily capacity of 2,000 tons of material. S. E. Billman, St. Louis, Mo., is president.

$1,400 Yearly Limit Hurts Road Building

ONLY LOW-COST WORK POSSIBLE

"Many benefits of Federal Highway legislation are lost by the recent unsatisfactory limitations applying to the expenditure of highway funds provided by the 1935 Relief Act," declared Wm. P. McDonald, president of the American Road Builders' Assn.

"According to the ruling" continued Mr. McDonald, "for every $1,400 expended one man is to be furnished work on the job for one year and this figure must also include all necessary construction materials, equipment and transportation for the same period. The figure is insufficient to provide for the construction of anything but low cost improvement.

"Heavy traffic highways can not be built under this restriction, while low type construction is of no value in thickly populated areas where relief needs are greatest. Rather than relieve unemployment it will compel industry to lay off the men they now have and add them to the relief rolls. The present restriction, therefore, nullifies to a very large extent the purpose of the relief act, and returns us to the dark ages in road construction.

"There is no class of work that can be undertaken which will have as much permanent value and at the same time overcome the unemployment problem as successfully as a normal highway program.

"Inasmuch as State highway departments have planned programs which include many miles of high type heavy traffic construction it is extremely unfortunate that a restriction of this nature should be introduced to upset and retard these plans."

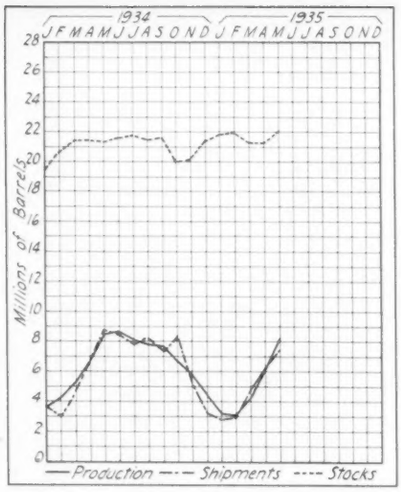
Mr. McDonald concluded his remarks by saying "that the entire highway industry would be adversely affected and that the benefit resulting from the construction of useful public works projects of a lasting nature would be greatly reduced unless the $1,400 restriction is modified."

Concrete Firm Buys Sixteen Truck Mixers

★ The Super Concrete Corp., Washington, D. C., is taking delivery on 16 new Chain-Belt Rex 3½-cu.yd. truck mixers. These are independently driven units and will be mounted on trucks, replacing old bodies formerly used. This company now operates 49 truck mixers.

Production of Cement Continues to Increase

The Portland cement industry in May, 1935, produced 8,222,000 barrels, shipped 7,428,000 barrels from the mills, and had in stock at the end of the month 22,014,000 barrels. Production and shipments of Portland cement in May, 1935, showed decreases, respectively, of 3.9 and 15.4 per cent., as compared with May, 1934. Portland cement stocks at mills were 3.3 per cent. higher than a year ago.



Cement production, shipments and stocks to May, 1935.

The statistics here given are compiled from reports for May, received by the Bureau of Mines from all manufacturing plants except one.

★ Two Babcock & Wilcox coal pulverizers have been installed at the plant of the Lone Star Cement Co., Alabama, at Birmingham.

★ The Standard Concrete Products Co., York, Pa., recently improved its plant by the installation of a Niagara screen and an A. D. Cook deep-well turbine pump.

Many Cement Plants Resume Operations

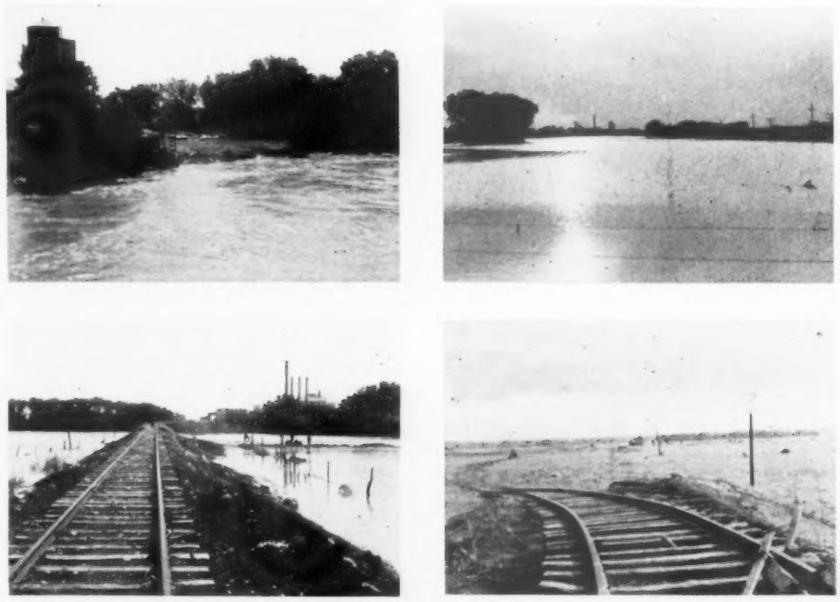
"PEAK" MAY COME IN AUGUST

The resumption of operations during June by an unusually large number of cement plants indicates that the peak of cement production for 1935 may not be reached until July or August instead of in June as it was in 1934. Among the plants which resumed operations in June are: Cowan Portland Cement Co., Cowan, Tenn.; Colorado Portland Cement Co., Fort Collins, Colo.; Crescent Portland Cement Co., Crescentdale, Pa.; North American Cement Corp., Security, Md. and Howes Cave, N. Y.; Olympic Portland Cement Co., Bellingham, Wash.; Oregon Portland Cement Co., Oswego, Ore.

Ready-Mixed Directors Hold Chicago Meeting

All but one of the members of the Board of Directors of the Ready Mixed Concrete Assn. met in the Palmer House, Chicago, June 29, for their regular semi-annual meeting. It was decided to continue the present program of operations without change, at least until the annual meeting to be held next January. Those present included the following directors: Messrs. Arthur C. Avril, Paul P. Bird, Alex. Foster, Jr., James F. McCracken, Joseph L. Shiely and H. F. Thomson, and V. P. Ahearn and Stanton Walker of the association's staff.

Flood Stops Cement Making



When the Republican River recently overflowed its banks it threatened the plant of the Nebraska Cement Co. at Superior and washed away 1½ mi. of the company's railway track.

Editorials

The Present Opportunity of Business

IN the termination of N.R.A. code regulation resulting from the Supreme Court decision in the Schechter case many business men saw the collapse of what they took to be a growing policy of the regulation of business by government. It seemed to them that the theory of political supervision of business activity had received a setback from which it might not for a long time recover and which might, indeed, prove to be its end. Too many of them believed that the National Industrial Recovery Act and the many activities inaugurated under it were the creatures of the moment and that when the moment had passed, as it appeared to have passed with the announcement of that decision, the creatures would pass with it. As an example of the readiness with which we are prone to deceive ourselves by wishful thinking, this incident stands out glaringly.

Government regulation of industry in its extreme form—and that is the form in which many business men visualize it whenever they think of it—depends on something more than the whim of politicians or the theories of political and social scientists. To be successful, in the sense of being able to survive the trials of criticism and experience, it must rest not only upon the support of legal sanction but also upon that far more important support, public opinion. That opinion is, in the last analysis, largely what business men make it. Where it is favorable to increasing the scope of government regulation of business, its strength and persistence may be attributed chiefly to the activities of those business men whose activities have appeared to make political intervention necessary. Where it is opposed to such regulation, it may be due to the fact that there are some business men who have not been too unmindful of the public interest and hence too intently centered on their own immediate objectives.

Public interest is not the vague concept that it was when the first laws regulative of business were enacted. While it is still impossible to give it an all-inclusive and a specific definition, the idea of what constitutes public interest in certain cases is much more definite in the mind of the average man and in that of the average jurist than it was when legislators were groping about for some form of, and some basis for, regulation that would curb the acquisitiveness of unfettered business. The last five years in themselves have provided sufficient evidence of the interdependence of all members of society to convince even the most skeptical of the definite and numerous ways in which a very trivial action may affect the interests of many people.

It ought to be evident that we shall have as much government regulation of industry as seems to be necessary and that business men have great opportunities for determining how great that need will be or will appear to be. If, in the absence of the restraining influence of the N.R.A. codes—however weak those influences may have been—business men in large numbers return to the unrestricted competition and resultingly destructive methods that prevailed before their adoption, we may confidently expect to see government tighten the bands that already exist and apply others that will be even more confining. If, on the other hand, they give real evidence of having learned the lesson of interdependent and coöperative action for the good of themselves, their customers and their employees, as it was disclosed to them in many different industries wherein compliance with code provisions was general, we may with almost as much confidence look for a weakening of the sentiment which now cries for more drastic control of business by the agencies that exist for public protection. The greater the disposition shown by business men to deal fairly with all the groups on whose well-being their own success depends, the less will be the likelihood of government's tightening its grasp on the operations of industry.

Our own industries, like all others which operated under N.R.A. codes, are faced with this choice. They may fall back—and it would be a retrogression in more senses than one—upon the methods which were prevalent before the objectives of the National Industrial Recovery Act began to be realized and in so doing invite government to step in and take charge, or they may move forward along the lines of coöperative betterment that the last two years have shown them and thus escape a form of regulation that is certain to outdo in scope, method and effect any precedents established or possibilities foreshadowed by the N.R.A. The public—and that includes producers as well as consumers, employers as well as workers—has become conscious of its interests and its rights, however much these may differ between the many groups that compose it, and their knowledge of the ways in which these can be protected has grown almost as rapidly as their awareness of the fact that they have too often been damaged and abused. We find, therefore, a people alert to its opportunities for self-service—although still not sufficiently aware of its responsibilities—and determined to see that those interests are conserved and those rights preserved.

At their recent convention in Hot Springs members of the lime industry decided that the gains derived from nearly two years' operation under their N.R.A. code were too valuable to be allowed to slip away, and unanimously approved a declaration of policy and a tentative form of voluntary industry agreement designed to conserve them. In their action there was undoubtedly something more than a mere desire to hold fast to that which seemed good. They seemed to be motivated almost as much

by a striving to envisage and protect the future of industry as by a wish to attain immediate benefits. What they initiated may prove to be an important factor in preventing an inrush of government agents intent on policing an industry which has shown a strong disposition to manage its own affairs in a manner considerate of its members, employees and customers.

This great opportunity presents itself to every industry now, and the readiness with which it is embraced may prove to be an accurate index of industrial stature and fitness to survive. The obligation is one which every industry owes, not only to itself, but to every other industry as well. The whole theory of business enterprise has been and still is on trial and if it can not meet the challenge of modern critical analysis with facts instead of dogmas, with demonstration instead of prediction, it may not survive the attack. The theory of government regulation has the support of political interests, in addition to whatever ethical justification may be given it by the too highly developed egocentrism of some business men, and this makes it a very formidable adversary in a controversy that should be decided on facts. This political interest, this tendency to build up huge political agencies wherever an excuse appears, being dependent for its success on the support of public opinion, can be overcome only if business men will demonstrate by sensible, considerate and long-range decision now, that further intervention by government in the public interest is unwarranted and but a cloak for strengthening political organizations and for taking increasing toll from the public purse.

We urge upon all industrialists the adoption, by themselves individually and by their industries as integrated groups, of policies that will protect their present interests and insure their future security against the increasingly threatening advances of governmental regulation, and, perhaps ultimately, governmental conduct and ownership of industrial activity. The public and the government are watching to see whether business men are capable of solving this problem fairly and wisely, and this is the period, in our opinion, when the demonstration can be most easily and most convincingly made. The danger of government putting an end to profit-motive industry may become a very real one.

Toward Industrial Integration

THROUGH the action taken by the boards of directors of the three national aggregate associations at their recent Chicago meetings ultimate integration of the aggregate industry was brought one step nearer realization. For a long time the conviction that the interests of this group of producers can be served best by an amalgamation has been gaining strength, but the sentiment in favor of a complete submergence of individual industrial identities in the larger unity of the interests common to them all had not yet reached the point where definite action directed toward that objective appeared to the directors to be immediately desirable.

It has always been our opinion that these three branches of the nonmetallic-mineral industries had so many common goals and so many common problems that the wisdom of concerted action aimed at attaining the one and solving the other could not fail to appeal strongly to the good sense of their members large and small. The recent rapid spread of this feeling has been due very largely to the broadening and consolidating influences of united efforts exerted in behalf of all under the recent N.R.A. code. But even before the common interests of the three groups were brought into such strong relief, by the need for adopting a united front in dealing with governmental forces in the last two years, the advantages of unification had gradually become evident to many who had previously insisted most strongly on the maintenance of industrial individuality. With the ground thus prepared, with minds thus opened to the appeals of intelligent self-interest, the necessities of the N.R.A. period made many converts.

Many of those who went through this shifting from opposition to advocacy may feel that the new plan of a Mineral Aggregates Institute, designed to act for the three groups on matters of common interest, does not go far enough in the direction of unification, and it is even more likely that those who have always favored ultimate integration will share that view. There are, however, a considerable number of those who are themselves unprepared for such a thoroughgoing change and who, therefore, believe that the groups are similarly unprepared and that complete amalgamation is too great a step to be taken now. Which view has the larger number of supporters among all members af the groups is unknown, and until their representatives feel more certain of where the preponderance of opinion lies it will be futile to expect anything more than a cautious approach to what seems to us to be the solution.

Every advocate of one plan or the other—the maintenance of the *status quo ante* or the adoption of the complete unification idea—may be accused of self-interest, but we think that the latter plan would more nearly meet the needs of an intelligent self-interest than the other. We say this with regard to the self-interest of the three groups as a whole, of each one considered separately, and of the indiviual members of the groups. It is for this reason that we believe that the three boards are to be applauded for the good sense, for the frank recognition of conditions, and for the long-range foresight that led them to approve a plan which, while it may not satisfy the idealistic objectives of those who (like ourselves) take the most advanced view of the future well-being of the groups, leads unmistakably in the direction of integration. This unification, it seems to us, is certain to come if for no other reasons than that, in our view, it holds more promise for the future security of these groups than the old plan and that it appears to be the end desired by most of their members.

High-Early-Strength Cement Committee Rejects Proposed Standard

A. S. T. M. Discusses New Abrasion-Testing Machine, Particle Size, Mortars and Lime

THE thirty-eighth annual meeting of the American Society for Testing Materials was held in Detroit during the week of June 24, 1935, rather than at the seashore. The attendance of 1,012 persons who paid a registration fee of $1 in comparison with 823 persons so registered in Atlantic City last year indicates that there must be some increase in business activity or optimism on the part of the society members.

There were 15 public sessions of the society and very many sessions of the active committees. Committee work went forward with the customary vigor common to such meetings, but there were no announcements made concerning any activities of unusual interest.

General Sessions.—In view of the fact that the meeting was held in a great industrial center the papers were predominantly along lines of interest to the locality in which the meeting was held. In addition to the usual committee reports on the methods of testing and specifications for metals there were society papers on tests for products used in automobile manufacture and allied products.

The annual meeting also held an exhibit of testing apparatus and related equipment, which was of interest to members concerned with chemical and physical apparatus used for various laboratory purposes.

At the annual dinner of the society the Charles B. Dudley Medal was awarded to C. A. Hogentogler and E. A. Willis of the U. S. Bureau of Public Roads for their papers on *Subgrade Soil Testing Materials,* which was presented at the society's 1934 meeting.

The society also recognized the activities of the Federal government in modern housing by having speakers discuss this subject at the dinner. A paper by M. L. Colean, director, Technical and Low-Cost Housing Divisions, on *The Federal Housing Problem,* and one by J. E. Burchard, vice-president, Bemis Industries, Inc., on the *Rôle of Materials in Modern Housing,* discussed the present developments for financing and building both individual and apartment houses with governmental assistance and the specification requirements necessary for such extensive work.

Papers of considerable importance to the cement and allied industries were presented during the latter part of the week, of which the following were of unusual interest.

New Testing Machine for Abrasion.—A paper on the *Los Angeles Abrasion Machine for Determining the Quality of Coarse Aggregate,* presented by D. O. Woolf and D. G. Runner of the U. S. Bureau of Public Roads, created a great deal of interest, not only before the general session of the society, but in various committee meetings held in connection with the specifications and testing of aggregates. This machine has been in use in Los Angeles for a number of years and the results of wear test have been correlated with service records. The particular advantages of this apparatus for testing the wear of stone are that the test can be made on material being used in regular construction and it is not necessary to provide samples of uniform size such as is necessary for the Deval abrasion machine. Furthermore, the test can be conducted in a few minutes instead of the 5 hr. required for the present abrasion test. These two items alone seem sufficient to warrant engineers in giving consideration to this method of testing. The correlation of the data with service records appears to be good and in discussing the results presented in the paper, A. T. Goldbeck, engineering and research director of the National Crushed Stone Assn., called attention to the comparison between the results obtained by the Los Angeles abrasion machine with those obtained in his laboratory by using a rotating wheel and circular track which produces surface wear similar to that developed under actual traffic. It was pointed out by Mr. Goldbeck that the correlation between the two methods of testing was unusually good and since the wear test made under the wheel indicates actual field conditions, it would appear that the new abrasion machine would also closely duplicate such data.

Test Measurements of Concrete.—The Determination of Modulus of Elasticity and Poisson's Ratio of Concrete at Ages of Fourteen Days to Four Years, by L. H. Koenitzer, Kansas State College of Agriculture and Applied Science, was presented by C. H. Scholer, as being a continuation of the work of P. M. Noble which was presented before the society in 1931.

The tests show that the modulus of elasticity of plain concrete at the end of 4 yr. is about the same as at the age of 14 days. Poisson's ratio for the mixes studied indicate a rapid increase for the first 56 days and then a gradual decrease until at the age of 4 yr. the ratio was in most cases equal to or less than Poisson's ratio at 14 days.

Sand-gravel aggregate concrete failed to increase in strength; the strength at the age of 4 yr. was in many cases equal to or less than that at the age of 28 days.

Sand-gravel aggregate concrete specimens when tested wet gave a lower modulus of elasticity than when the specimens were tested dry. The opposite was true for coarse aggregate specimens. Aggre-

gates have an important influence on the elastic properties of the resulting concrete.

Concrete Shrinkage.—Two excellent papers were presented in connection with the study of concrete shrinkage. A paper by R. W. Carlson, Massachusetts Institute of Technology, on *The Chemistry and Physics of Concrete Shrinkage* was a very interesting and philosophical treatment of the subject and the author should be commended for his boldness in presenting original thought along these lines. The paper had not been preprinted so that, unfortunately, the discussion was not extensive but additional discussion by letter was promised and this should make this paper of unusual interest when published.

A paper on *The Shrinkage of Concrete,* by Inge Lyse, of Lehigh University, showed the results of tests obtained with apparatus similar to that developed by R. E. Davis, and described in the report of Committee C 9. This paper had not been preprinted and, on account of the extreme lateness of the hour at the last session, an ample discussion of the paper was not possible.

Measurement of Particle Size.—Surface area and particle size of cement and other fine materials was discussed in a paper by R. N. Traxler and L. A. H. Baum, both from the Technical Bureau, Research Division, Barber Asphalt Co. The paper gives the report of studies made on various limestones and on slate and the development of a technic for the dispersion of finely-pulverized solids. The results obtained on various powders were compared with the size-distribution data given by an air analyzer of the type described by Roller in a paper presented before the society in 1932. The writers conclude that a direct proportionality does not exist between surface area and turbidity and that for accurate investigation of particle size distribution in mineral powders of the type studied the turbidimeter appeared to be unreliable but that for the detection of changes of size in a single product the method has practical value.

Concrete Disintegration.—A paper on *Research on Concrete Disintegration,* by H. S. Mattimore and G. A. Rahn of the Pennsylvania State Highway Dept., gave the results obtained from a study of 45 experimental concrete head walls constructed in McKean County, Pa., about 4½ yr. ago. Experience in the field had indicated that unusual difficulties were being encountered in that section of the country and the investigation was begun to compare the results obtained by different cements and sands which were obtainable in that district. A method of evaluating the results of deterioration in concrete structures was presented and unusual information showing the numerous cycles in ground-temperature changes which occur during the winter months. The authors of the paper did not draw definite conclusions but presented the information as a matter of record for the attention and study of the society where materials are to be subjected to extreme exposure and rapid alternations in temperature.

Report of Committee on Cement.—Committee C 1 on Cement presented a report showing its activities during the past year along various lines. Recently a Tentative Method of Chemical Analysis of Portland Cement (C 114-34T) was published by the committee and the working committee is continuing in its study for the improvement of this method. Where the specifications do not require a complete chemical analysis, but place limits upon the amount of magnesia allowable, it is desirable to have a shorter method available than that contained in the present Standard Methods of Sampling and Testing Portland Cement (C 77-32) and, therefore, the working committee has been conducting an investigation among a group of laboratories covering quick methods for this purpose. The results indicate that at least two of the shorter methods may be adequate as they appear to be precise and accurate.

A Method for Rapid Volumetric Determination of Magnesia in Portland Cement, by Fred P. Diener, assistant chief chemist, Northampton plant, Universal Atlas Cement Co., and *A Method for the Precipitation and Titration of Magnesium Oxyquinolate in the Presence of Calcium Oxalate, and Its Application in the Analysis of Portland Cement and Similar Silicates,* by John C. Redmond, Battelle Memorial Institute, Columbus, O., were printed in connection with the report of Committee C 1 and are, therefore, immediately available for use by anyone interested in short and accurate methods when a complete analysis of cement is not required. The working committee reported that these methods are presented without definite recommendations other than that they appear to be precise and accurate and further investigations are under way.

Low-Heat and Blended Cements.—The committee is studying the behavior of low-heat and blended cements but is not in a position to recommend any specifications. The specification for sulphate-resistant Portland cement which was proposed at the March meeting of the society in 1934 and discussed at the annual meeting in Atlantic City has not been recommended by the committee for final adoption as a tentative standard, although mills throughout the country are manufacturing this type of cement. The purchasers of such cement are making no demands on the committee for the preparation of the specification which they can prepare along lines suitable to themselves.

High-Early-Strength Portland Cement.—The Committee on High-Early-Strength Portland Cement presented Tentative Specification C 74-30T for advancement to standard, but when the recommendations reached the floor of the general session of the society on Friday evening, the recommendation that the tentative specification be made a standard was rejected. It was reported that in the meeting of Committee C 1 the question of the definition for Portland cement had been brought up before the committee and the chairman of Committee C 1 had been instructed to appoint a small committee to report on the advisability of making changes in the definition of Portland cement to cover both normal

Portland cement and high-early-strength Portland cement. This action was reported at the general session and a producer of admixtures called attention to the fact that in the manufacture of many products in various lines it is becoming customary to add small amounts of specially-prepared materials and the results are beneficial to the products. It was contended by the speaker that a similar condition may exist with Portland cement which would make it desirable to add limited amounts of materials to the clinker during the process of grinding the cement, which method is now prohibited under the present definition of Portland cement. The suggestion was made from the floor that the present definition for Portland cement be reworded to permit the addition of small amounts of admixtures which the National Bureau of Standards would determine not to be injurious to the cement. After a ballot by actual count of members the recommendation of the committee was lost and the specification for high-early-strength Portland cement will remain a tentative standard pending a report of the special committee on the definition for Portland cement.

During the past year Committee C 1 presented to the society through Committee E 10 on Standards, in addition to the Tentative Method of Chemical Analysis of Portland Cement (C 114-34T), a Tentative Method of Test for Fineness of Portland Cement by Means of the Turbidimeter (C 115-34T), which has become widely used for the controlling of surface area in the manufacture of cement.

A report on the Cement Reference Laboratory indicated the great improvement which is being made in laboratory procedure due to the work of the laboratory, and the development of temperature and humidity control in laboratory procedure was pointed out by means of diagrams and photographs.

The sponsoring committee on masonry cement is giving consideration to Tentative Specification and Tests for Masonry Cement (C 91-32T), but it has been unable to receive the necessary coöperation and assistance from the manufacturers of this material, either as to constructional suggestions or criticisms, so that the method will be continued as tentative for another year.

A paper, presented before the society, on *Tests of Mortars for Reinforced Brick Masonry*, by M. O. Withey and K. E. Wendt, of the University of Wisconsin, covering approximately 82 mixes and 4,000 test specimens furnished a very complete set of data which will be of unusual value to those interested in this particular subject. The tests include the use of admixtures under various conditions of curing and show the strength-age and contractionage relations under these conditions.

Report of Concrete Committee.—Committee C 9 reported coöperation with Committee D 4 in the development and changes of specifications and presented a number of proposed tentative standards and revisions of tentative standards as well as the adoption of one new standard. All the recommendations of Committee C 9 were approved by the society and they will be submitted to letter ballot.

Proposed Tentative Standards.—The following tentative standards were presented for consideration:

Tentative Method of Making Compression Tests of Concrete Using Portions of Beams Broken in Flexure (C-35T).

This method permits the use of broken ends from beams used in transverse testing for making compression tests, thus permitting both tension and compression tests to be made on the same specimen.

Tentative Method for Determining Voids in Coarse Aggregate (C 30T).

This method is to be used for making the calculation for percentage of voids based on methods of test which are now society standards.

Tentative Method of Test for Amount of Material Finer Than 200-Mesh Sieve in Aggregate.

This method is intended to combine two present methods and, when adopted as standard, to supersede the present Standard Method of Test for Quantity of Clay and Silt in Gravel for Highway Construction (D 72-21) and the Standard Method of Decantation Test of Sand and Other Fine Aggregates (D 136-28).

Revised Tentative Method of Test for Soundness of Fine Aggregates by Use of Sodium Sulphate or Magnesium Sulphate (C 88T) and Revised Tentative Method of Test for Soundness of Coarse Aggregates by Use of Sodium Sulphate or Magnesium Sulphate (C 89T).

Although these proposed revisions were accepted for submission to letter ballot, it is well understood that these methods are not to be considered as complying with the present need of the users and producers of these materials. This is particularly true for the methods for testing fine aggregate.

Tentative Specifications for Ready-Mixed Concrete (C 94-33T).

Subject to minor revisions these were approved by the society for submission to letter ballot. The revisions are intended to clarify the meaning of such terms as "dry materials," "moisture," etc.

Committee Papers.—The report of Committee C 9 presented papers on the evaluation of data, which describe statistical methods to be used in studying data. The work of this sub-committee will be of interest to investigators desiring to have a mathematical method for the evaluation of laboratory test data.

Committee C 9 also presented for information a method of test for determining the volume changes in concrete by Raymond E. Davis, professor of civil engineering, University of California, which outlines a desirable method in sufficient detail to make it possible for other laboratories to use this method in studying volume change.

Report of Paving Materials Committee.—Committee D 4 on Road and Paving Materials presented the following recommendations which were accepted by the society to be sent out for letter ballot:

I. Proposed Tentative Standards.

Tentative Volume Correction Table for Asphaltic Products.

(*Continued on page 33*)

New Constant-Temperature Room Part of Volunteer Testing Equipment

By D. W. YIKE

Chief Chemist, Volunteer Portland Cement Co.

THE plant of the Volunteer Portland Cement Co., near Knoxville, Tenn., has been in operation since early in 1928 and is known as one of the outstanding plants in the South. The company has always been progressive and was one of the first to realize the necessity of a modern constant-temperature room for various tests. This room is completed and has been in operation for several months. It has proved so successful that a report of its design, construction and operation may be of interest.

The plant is equipped with a small laboratory at the mill for the hourly routine tests but the main laboratory (Fig. 1) is two-tenths of a mile from the plant, high up on a ridge overlooking the Holston River. Here all the daily composite samples are tested, both for chemical and physical properties, and all research work is done. The distance that the laboratory is from the plant eliminates all danger of any dust contamination or vibration from the heavy mill machinery.

The walls of the main laboratory are marble and the floor and ceiling concrete, making it an ideal place within which to build this room. The room had four windows and three doors. These were all closed, except one door, with cinder blocks and then stucco was placed on the outer surface of the blocks giving the windows and doors the appearance of concrete shutters. The room was 16 ft. 9 in. by 12 ft. 3 in. and had a 10-ft. 3-in. ceiling.

The floor was laid on 2-in. by 6-in. joists placed at 16-in. centers. A rough $\frac{3}{4}$-in. floor was placed on these joists and then a $\frac{5}{8}$-in. pine floor was placed on top of this rough flooring. Battleship linoleum $\frac{1}{4}$-in. thick was cemented to this finished floor with $\frac{1}{8}$-in. felt mat between. The walls were of 2-in. by 4-in. studdings at 16-in. centers and placed 6 in. away from the marble walls. This 6-in. dead air space increased the insulation and helps to make the room temperature easy to control. Wire with 2-in. meshes was nailed to the back of the studdings to prevent the rock wool, which was placed between the studs, from falling back into the dead air chamber. The lower portion of the wall finish is three-ply wood panel board with a 7-in. base board and a $\frac{1}{4}$-round moulding. The upper portions of the walls as well as the ceiling are of gypsum plaster board with the joints all neatly cemented. A 4-in. chair rail covers the joint between the wooden and gypsum boards.

The ceiling is of 2-in. by 6-in. joists with the 6-in. air chamber like the ones behind the walls. The space between these joists is filled with rock wool and as stated before these joists are covered by gypsum board. The reason for using the gypsum board rather than metal lath and plaster was to avoid the excessively moist condition in the room which usually results with the latter type of construction. The inside dimensions of the finished room are 15 ft. by 10 ft. 6 in. with an 8-ft. 9-in. ceiling. The walls and ceiling are white enamel. The light is furnished by a large electric fixture of the indirect type suspended in the center of the room. It contains two 75-watt bulbs.

A large refrigerator door is located as shown in Fig. 3 and assures complete insulation for the only opening in the room. Fig. 3 shows the plan of the entire room.

The air conditioner chosen for this room is a Kelvinator, self-contained unit, model SC-50 DC with condensing unit motor operating on 110-220-60-1 current and the fan motor operating on 110-60-1 current. Three electric heater strips were installed in front of the conditioner fan for this particular installation in order to raise the room temperature should it drop below 70 deg. F. The temperature is controlled by a Minneapolis-Honeywell thermostat which operates both the cooling and

Fig. 1. The main laboratory.

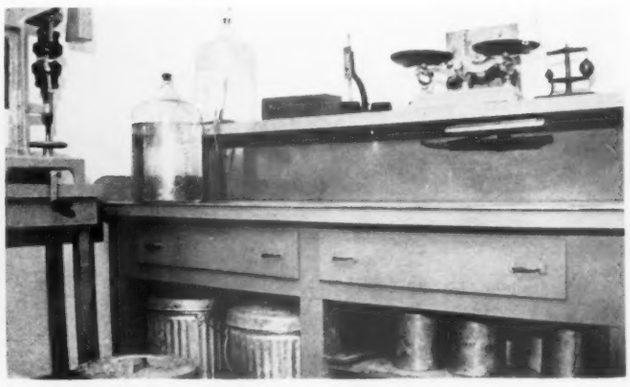


Fig. 2. The bench for physical testing.

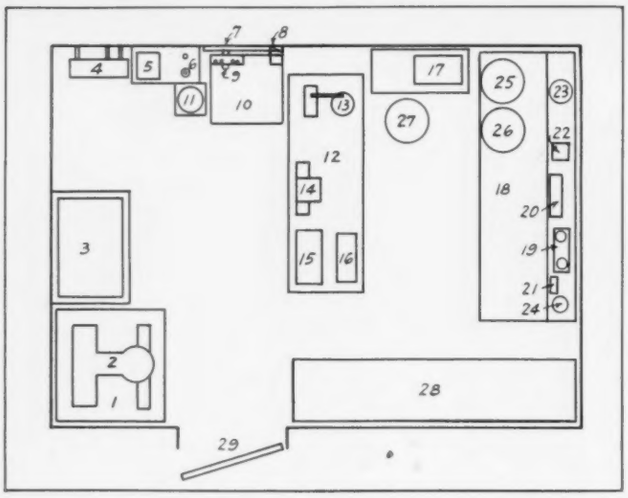


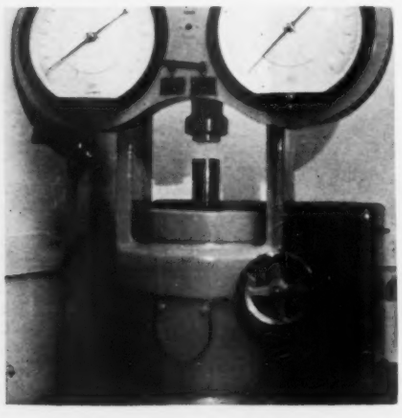
Fig. 3. Plan of the constant-temperature room, showing (1) table for (2) Baldwin-Southwark compressor; (3) Kelvinator air-conditioner; (4) Wagner Turbidimeter; (5) micro-ammeter; (6) timing burette and flask; (7) kerosene-supply burette; (8) settling-tank leveling shelf; (9) stirring brush and motor; (10) turbidimeter work-table; (11) waste-kerosene container; (12) table for (13) Parr oxygen calorimeter, (14) Lerch "heat-of-solution" calorimeter, (15) chainomatic balance and (16) torsion balance; (17) Riehle briquette machine; (18) physical testing bench with (19) large balance and (20) weights, (21) Gilmore needles, (22) Vicat needle, and constant-temperature water for (23) coal calorimeter and (24) for physical tests; (25) standard Ottawa sand and (26) graded sand containers under bench; (27) waste can; (28) moist closet; (29) refrigerator door.

heating equipment and maintains a constant temperature to plus or minus one degree.

The room is equipped with a Friez Type R/4-A temperature and humidity recorder which records a 24-hr. card. This chart is approximately 5 in. by 3 in. and is easily filed due to its rectangular shape. The temperature of the room is kept between 69 and 71 and the relative humidity between 60 and 80. Some variation in humidity is due to the moisture of the air freezing on the coils while the cooling unit is in operation and then melting and being blown out into the room after the unit has stopped; the fan of the air conditioner runs continuously.

The compression testing machine (Fig. 4) is a Baldwin-Southwark, 75,000-lb. capacity machine with which 2-in. by 2-in. cubes, 2-in. by 4-in. cylinders and 3-in. by 6-in. cylinders can be broken.

The Wagner Turbidimeter (Fig. 6) is mounted independently on the wall while the stirring motor and brush are mounted on a bracket fastened to the table. This eliminates all vibration from the Turbidimeter cabinet and the micro-ammeter. The timing burette is clamped to a rod which is set in the micro-ammeter shelf. The kerosene supply is kept in a 500-c. c. burette mounted on the wall over the settling-tank shelf. The large glass bottle under the Turbidimeter is for the waste kerosene. The temperature of the kerosene is kept within one degree due to the constant temperature of the room, thereby eliminating any variations due to a change in the viscosity of the kerosene.



Left.—Fig. 4. The compression tester.
Right.—Fig. 5. The oxygen calorimeter.

The bench for physical testing (Fig. 2) has tubular lights placed under the shelf in order to throw the light rays upon the table and eliminate shadows. The mixing water is on the right end of the shelf, the water for the coal calorimeter on the far end of the shelf at the left and the nitric acid for the heat of hydration calorimeter on the top of the table. The cement to be tested is stored in the gallon cans on the shelf under the right side of the table and the molds are stored on a shelf directly under the cement containers. Under the left-hand portion of the table are the two containers, one for standard Ottawa sand and the other for graded sand. This means that the cement, water, sand, molds and mixing table are kept at a constant temperature of 70 deg. An electric clock is located on the wall over the physical bench. The Riehle briquette machine is visible at the extreme left in Fig. 2.

Shown in Fig. 5 is the Parr oxygen bomb coal calorimeter. In the center is the cabinet calorimeter for determining the heat of hydration of cement and at the right is seen the end of the chainomatic balance. The constant temperature in the room is ideal for the heat of hydration calorimeter. The nitric acid supply as stated before is kept in this room at a uniform temperature. As it is necessary to weigh damp and partly-hydrated samples of cement without loss of moisture for this heat of hydration determination the chainomatic balance is placed next to the calorimeter in this room. It can be readily understood why a constant temperature is necessary for the calorimeter when one realizes that the temperature changes of this machine are read to .001 deg.

The moist closet (Fig. 7) is of cypress frame and covered with thin copper which is tinned on the inner side. All cross-beams are notched into the upright posts and after it was completely constructed all corners were strengthened with brass angles. The shelves in the moist closet are of $\frac{3}{8}$-in. brass rods $3\frac{1}{2}$ in. apart, with the ends turned to 3/16 in. and are set in $\frac{1}{8}$-in. by 1-in. brass strips which are screwed on to the upright post along the sides of the moist closet. The pans are of 22-gage copper which has been tinned on both sides. They are 5 in. deep and have

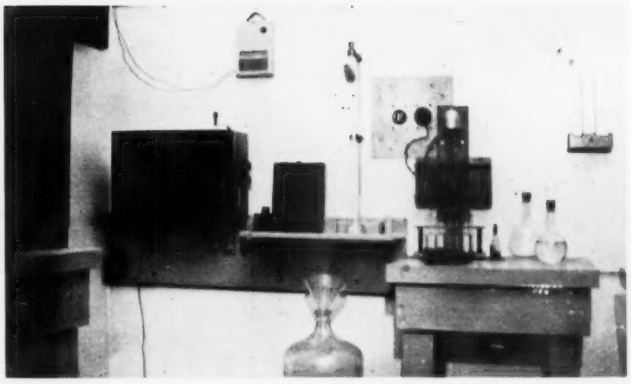


Fig. 6. The Turbidimeter.

Fig. 7. The moist closet.

rolled tops, the rolls being on the inside of the tanks. The bottom of the moist closet is used as a tank for storing specimens, giving a total storage space of over 60 sq. ft. or enough space to store specimens for tests from 1 day to 6 months on two daily samples. The water for the moist closet passes through 75 ft. of thin copper tubing which is placed on the back of the upright post. This corrects the temperature of the water to room temperature before it enters the moist closet. After entering the moist closet it passes through jeweled spray nozzles, one nozzle sprays against the back of the closet just inside the end of the top tank and the other spray goes directly into the upper tank. From there it passes through the entire set of pans and is discharged from a point just off center in the bottom tank. When the pipe is removed there is no shoulder or flange in the bottom of the pan to prevent it from completely draining. The threaded connection below the pan is for a standard garden hose connection making it possible to drain and clean any pan without disturbing any of the others. A small hose that reaches to the sewer is used for this purpose. The doors are of stainless steel and are 1/16 in. thick with strengthening strips on top. On the right section of the closet in the illustration the upper half of the door is opened while in the center compartment both halves of the door are open and in the last section both halves are closed. These doors are light and are easily opened. Each section of the doors is equipped with safety catches. The 1/16-in. doors slide in a 3/32-in. channel. Because of the high humidity in the moist closet, it is necessary to protect the briquettes and cubes from the dripping water by thin tinned copper sheets which are hung from the rods of the shelf above.

One of the major problems to deal with was that of clean water. There is no city water in the laboratory and the water supply is from the large tank which is filled from the Holston River. This water at times contains a considerable amount of silt and during rainy spells is quite dirty. The Kelvinator requires a large supply of clean water for its condenser and the water for the moist closet had to be clean and pure so some method of obtaining a considerable amount of clean water was necessary. For this purpose a Scaife Type FV-14 filter of 120-gal. per hr. capacity was installed. This is located in another room of the laboratory and the supply of water is piped into the constant temperature room. This water is also used for the cement fineness determinations.

The entire room, moist closet, tables, etc., were built by the employees of the Volunteer Portland Cement Co., the only equipment purchased being the Kelvinator, calorimeter and equipment of that sort.

A. S. T. M. Meeting *(from page 30)*

Tentative Method of Test for Determination of Amount of Material Finer than No. 200 Sieve in Aggregates.

II. Proposed Revision of Standard.

Method of Test for Distillation of Bituminous Materials Suitable for Road Treatment (D 20-30), editorial change.

III. Proposed Revision of Tentative Standards.

Method of Test for Residue of Specified Penetration (D 243-32T).

Method of Testing Emulsified Asphalt (D 244-34T).

IV. Proposed Adoption of Tentative Standards as Standards.

Method of Test for Ductility of Bituminous Materials (D 113-32T), as revised.

Lime.—Committee C 7, on Lime, did not make a report and no formal meeting of that committee was held. A paper on *Classification of Hydrated Limes by a Mobilometer*, by T. G. Dixon and J. R. Withrow, Ohio State University, was presented by Mr. Withrow. The apparatus developed at the Ohio State University in connection with methods of classifying limes for indicating finishing properties by means of a loaded plunger was described in the paper to be printed at a later date. The informal report of Sectional Committee for Specifications for Plastering stated that progress is being made in the preparation of specifications for limes to be used for that purpose.

Concrete Pipe.—Committee C 13, on Concrete Pipe, presented recommendations to the society which are listed below. All these were accepted for submission to letter ballot.

I. Proposed Tentative Standard.

Specification for Concrete Irrigation Pipe (C 76-T).

II. Revision of Tentative Standard.

Specifications for Reinforced Concrete Culvert Pipe (C 76-30-T).

III. Adoption of Tentative Standards as Standard.

Specifications for Non-Reinforced Concrete Sewer Pipe (C 14-34-T) as revised.

Specifications for Reinforced Concrete Sewer Pipe (C 75-34-T as revised.

Cement Industry Faces Serious Problems and Unusual Opportunities

By BLAINE S. SMITH
President, Pennsylvania-Dixie Cement Corporation

IT seems a paradox that an industry, which has so convincingly evidenced through achievement its contribution to public welfare, should find itself faced with perhaps the richest opportunities since its birth, yet at the same time discovering the path to those opportunities obstructed by problems created by influences outside the industry, and the insidious elements of those problems apparently unnoticed by many who are enjoying the benefits provided by the industry.

Portland cement, which has frequently been named "the cheapest of all products undergoing a complete manufacturing process," is the basic material in the production of concrete. Concrete, in turn, has been complimented by leading engineers with statements to the effect that, without it, such construction projects as the Panama Canal and others similar would have been impossible. Concrete, in short, has established itself as an essential to modern construction of all types providing the utmost in utility, dependability and economy.

The drivers of more than 24,000,000 motor vehicles are saving up to 2 cents per mile when they drive over concrete highways, as compared to their cost over unimproved types. These same drivers are paying into the treasuries of the 48 states annual motor taxes totaling millions, the primary purpose of these taxes being to establish and maintain modern highways. But, see what has happened; in 7 years, according to one authority, $550,000,000 of such taxes has been diverted by a number of states to other uses, and that amount would have provided motorists with 20,000 additional miles of paved highways.

That brings into the picture the first big opportunity of the cement industry, with its attendant problem. Accredited authorities state that of the country's 3,000,000 miles of highways, 2,500,000 miles, or 85 per cent., are still classed as mud and dust. It is further stated that right now there is actual need for 100,000 miles of paved roads; and 30,000 railroad crossings dangerous to motorists and others should be safeguarded with modern underpasses and overpasses. Here is presented one big opportunity for the cement industry, but an imposing obstacle in the path is that problem of motor-tax diversion.

This motor-revenue diversion is widespread, occurring in 27 states. In some states, of course, it is more serious than in others. Not only is such diversion a great injustice to the motorists who pay the taxes, but it is to be criticized because if those funds were applied to highway construction as originally intended, then, according to the U. S. Bureau of Roads statement, 75 cents to 90 cents of every dollar spent would go to labor.

If a large number of the 24,000,000 motorists would become articulate and register objections to the diversion of motor taxes, then the opportunity for the cement industry in the highway field would become real instead of apparent; moreover, producers of sand, gravel and stone, machinery, coal, oil, explosives and sacks, the railroads and others would enjoy increased business if the diversion of motor revenues were discontinued. Therefore, it would seem desirable that each of these industries coöperate actively and aggressively in campaigns to prevent diversion.

In the housing field there is indicated an expanded market for cement. Authoritative surveys indicate an existing need for new homes stated to be from 1,750,000 to more than 3,000,000, and 16,000,000 homes are mentioned as "live" prospects for modernization. Each new dwelling potentially could use 150 bbl. of cement. The various Federal agencies interested in housing activities are pointing out the desirability of fire-resistance and permanence in construction and concrete has long since proved its trustworthy qualities in that direction.

(Continued on page 38)

The Present Status of Type B Cement After One Year's Experience

By P. J. FREEMAN

Principal Materials Engineer, Tennessee Valley Authority

DURING the past year the American Society for Testing Materials adopted a Tentative Method of Test for Compressive Strength of Portland-cement mortars, issued under the designation C109-34T. Although the society has this method of test, it does not have a specification for cement which requires that the method be used, and since the Tennessee Valley Authority has been using a similar method of test in the acceptance of about 1,300,000 bbl. of cement, the experience of the Authority in the use of this method may be of some interest to cement manufacturers and users.

T. V. A. Type B Cement.—During the spring of 1934 the Tennessee Valley Authority purchased 315,000 bbl. of what is known to the Authority as Type B Cement from five different mills under a specification which had been developed for the Authority by the U. S. Bureau of Reclamation in Denver, Colo. This specification was along lines similar to that for low-heat cement being used in the construction of Boulder Dam, but sufficiently modified to produce a cement which would make satisfactory concrete in both the winter and summer weather which prevails in the Tennessee Valley.

Since that time the Authority has placed contracts with ten mills for approximately 7,000,000 bbl., of which 1,300,000 bbl. has been placed under test up to this time. The chemical requirements for this cement were identical with those covering the first purchase, but the method of making the physical tests and the specification for the cement were changed to harmonize with what at that time was the proposed A.S.T.M. Tentative Method of Test for Compressive Strength of Portland-cement mortar, which requires the use of 2-in. cubes and a graded Ottawa sand in place of 2-in. by 4-in. cylinders and standard Ottawa sand.

Similar Specifications Used by Others.—Although such specifications have been given no official recognition by any of the engineering societies, other large users of cement are adopting similar specifications. The Colorado River Aqueduct being constructed by the Metropolitan Water District of Southern California will require 5,000,000 bbl., and the Tygart River project being constructed by the U. S. Engineer Corps in West Virginia will require about 2,000,000 bbl.

Table I shows a comparison of the specifications for these two projects, and also Type B cement, with the Boulder Dam low-heat cement.

It will be seen from Table I that the specifications for these cements do not have definite requirements for heat of hydration as is the case for the Boulder Dam cement, but rather extensive tests made by the Authority indicate that Type B cement as manufactured by all the mills has a heat of hydration approximately midway between the low-heat cement as used in the Boulder Dam and standard Portland cement.

Behavior of Type B Cement.—Type B cement is usually spoken of as a "modified" Portland cement in the absence of a better name. The term modified Portland cement is objected to by some engineers because the specifications are not really a modification of Portland cement, since the cement complying with these specifications has been produced by certain mills in the country during the past fifteen or twenty years and Type B cement will fully meet the requirements for standard Portland cement.

The experience of the Authority has shown that this cement behaves in about the same way as standard Portland cement in so far as the time of setting of the concrete is concerned. Tests of gravel-concrete cylinders made with Type B cement in comparison with normal Portland cement cured under standard conditions indicated that at the end of 7 days the strengths of both concretes were identical but at the end of 28 days concrete produced with Type B cement had a strength of about 400 lb. per sq. in. higher than that made with normal Portland cement, and at the end of 90 days Type B cement concrete had a strength of 600 lb. per sq. in. above concrete made with normal Portland cement. These tests would indicate that, contrary to the belief of people not familiar with Type B cement concrete, the early strengths obtained are equal to or better than those obtained with normal Portland cement and there is no delay in the final hardening of the concrete under any circumstances.

▼ ▼

AT the March meeting of the American Society for Testing Materials, which met in Washington in 1934, a group of the members of Committee C1 proposed a specification for Sulphate-Resistant Portland Cement which would limit certain chemical compounds and also require upper and lower limits for the specific surface of the cement particles, somewhat along the lines of the specifications for low-heat cement being used in Boulder Dam, but without the extreme requirements of that specification. Further discussion of the proposed specification took place at the June meeting of the Society at Atlantic City in 1934, but at the recent annual meeting of the Society in Detroit, Committee C1 had no further recommendations to make at this time.

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Table 1—CEMENT SPECIFICATIONS

	T.V.A. "B" Cement TVA-ES-1 MD-144	U. S. Engineer Tygart River Reservoir Dam Jan. 7, 1935	Metropolitan Water District Colorado River Aqueduct Spec. 79 Nov. 27, 1934	Bureau of Reclamation Boulder Dam Spec. 566
Normal Consistency	22.5 % for neat; 3-min. mix	Govt. SS-C-191	A.S.T.M.	22.0 % for neat; 3 min. mix; 10 % for mortar
Time of Set: Initial	Gil. 60 min.	SS-C-191	Gil. 60 min.	Gil. 60 min.
Final	Gil. 10 hr.	SS-C-191	Gil. 10 hr.	Gil. 10 hr.
Soundness	pat in steam	pat in steam	pat in steam	pat in steam
Strength: (*lb. per sq. in.*)	2-in. cubes graded Ottawa sand 3 days 750 7 days 1,500 28 days 2,500 28 da. > 7 days	2-in. cubes graded Ottawa sand 3 days 750 7 days 1,500 28 days 2,500	standard sand briq. 7 days 275 28 days 350 28 da. 7 days ×1.00	2-in. by 4-in. cylinder standard sand, 1:3 7 days 1,000 28 days 2,000 28 da. 7 days ×1.35
Fineness (*sq. cm. per gr.*)	1,600-2,200 Wagner turbidimeter	1,600-2,200 Wagner turbidimeter	1,800-2,200 Wagner turbidimeter	1,700-2,300 Wagner turbidimeter
Heat of Hydration*				7 days, 65 cal/g 28 days 75 cal/g
Ignition Loss	3.00 %	3.00 %	2.00 %	3.00 %
Insoluble Residue	0.85	0.85	0.85	0.85
SO_3	2.00	2.00	2.00	2.00
MgO	5.00	5.00	5.00	5.00
Ce_2O_3/Al_2O_3	1.5 max.			1.5 max.
C_3S	35-55	35-50	55	40 max.
C_2S				65 max.
C_3A	8 max.	8 max.	8	7 max.
F_4AF				20 max.

*Cumulative heat of hydration by heat-of-solution method.

Effect of Control of Fineness.—Since the cement is manufactured to a definite specification for surface area as determined by the Wagner turbidimeter, it is possible to have a far more accurate control of the fineness than in other specifications where the 200-mesh sieve only is used. It is the writer's belief that lack of uniformity in the workability of concrete is to a considerable extent due to lack of uniformity in the fineness of the cement, as indicated by the fact that with some cement it is possible for a contractor to place several more yards of concrete per hour when using one brand of cement than when using another brand of cement manufactured under the identical A.S.T.M. specifications. The experience of the Authority has been that if the cements are manufactured under requirements for specific surface it is possible to change from one brand to the other without in any way affecting the workability of the mix in the field. Although the specifications permit a variation between 1,600 and 2,200 sq. cm. per gr., the manufacturers are cooperating with the Authority in grinding the cement so that the average will be approximately 1,800 sq. cm. per gr. This allows a very comfortable margin above the lower limit, and this figure has been found to be quite necessary in order to avoid an occasional slipping off in the grinding process by the mills. When an attempt is made to run too close to the minimum limit, it is usually found that the minimum has been exceeded, so that, in order to accept the cement, it is necessary for the mill to blend such coarse cement with that having a finer grinding in order that a satisfactory average is obtained when retests are made.

We have no record of any complaint from the construction engineers in the field concerning the placing of concrete made with cement having an average fineness of about 1,800, and, furthermore, it is stated by them that the cost of placing concrete made from cement with such fineness is approximately 50 c. a sq. yd. below what it would be if the cement were ground to have a fineness comparable with that of normal Portland cement.

It would seem to the writer that for heavy masonry construction this feature alone is worth the effort to obtain a cement complying with the strict specification requirements for fineness such as may be obtained by means of a surface area rather than by the use of the 200-mesh sieve.

Uses of Type B Cement.—The Authority is specifying the use of Type B cement for all construction, including dams, bridges, and highways with a possible exception where the concrete should be unusually light in color, such as for hand railings on bridges. The color of the concrete produced with Type B cement is somewhat darker than that of concrete made with normal cement produced by most mills but, in general, there seems to be a more nearly uniform color of cement produced by all the ten mills under Type B specifications than produced by these same mills under standard A.S.T.M. specifications. This uniformity of color has made it possible to change brands of cement without disfiguring the concrete structure, although an attempt is made to use cement from a single mill in the construction of individual piers for bridges.

Durability Tests of Cement and Concrete.—Tests made by the Authority on Type B cement, using the sodium-sulphate test on small neat cement slabs as proposed by Merriman in connection with the Fort Peck project, indicates that in all cases Type B cement is sound and durable. This was not always true for the regular Portland cement manufactured by the same companies and subjected to this test, which indicates that there is a difference in the cement produced under Type B cement specifications and those obtained under the present A.S.T.M. standard specifications. Users of cement who are interested in this phase of cement resistance to sulphate solutions are referred to a paper presented by H. F. Gonnerman before the American Society for Testing Materials in June, 1934, on a *Study of Cement Composition in Relation to Strength, Length Changes, Resistance to Sulphate Waters and to Freezing and Thawing of Mortars and Concrete.*

His research shows that the resistance of cement mortars to sulphate waters is very high when the tricalcium aluminate is reduced below certain limits. Durability tests of Type B cement concrete conducted by the Authority have also indicated some very excellent results.

Inspection and Testing.—All sampling and testing of cement is conducted by the Engineering Service Division of the Authority through inspectors stationed temporarily at the ten mills.

The samplers are instructed to coöperate with the mills in sampling the cement, either during the process of grinding and filling the bin, or by sampling the bins after they have been filled, to obtain samples of cement representing every 400 bbl. and

have a quantity sufficient to fill two 1-qt. airtight tin cans. In order to avoid the cost of shipping to the laboratory, the practice is to mix each sample thoroughly and, after passing it through a 20-mesh sieve to place equal parts in two tin cans, one of which is shipped to the laboratory while the other is placed under seal at the mill to be used only in case of a retest. By this method large enough samples of cement are obtained fully to meet all specification requirements for the original test and a retest when the reserve samples are called for. As soon as the bin has been released for shipment, the inspector in the mill discards the cement samples which have been retained at the mill.

All tests of cement are made by the Authority in a central laboratory located in Knoxville, Tenn. Samples of cement are shipped directly to Knoxville, where they are separated in the physical laboratory into samples for chemical and physical tests. Physical tests are made in accordance with Tentative Specification C109-34T of the American Society for Testing Materials and the method for chemical analysis is approximately the same as that proposed by the A. S. T. M.

The physical tests are usually all made in the open laboratory, although a small temperature-controlled room is available for this purpose when necessary. The moist-curing room, however, is accurately controlled for humidity and temperature and graphical records obtained to indicate that no wide variation in temperature or humidity has developed.

Table II—CO-OPERATIVE TEST NO. 2 OF TYPE "B" PORTLAND CEMENT
(TVA Specification ES-1)

Summary of Physical Test Results

Laboratory No.*	Time of Setting (*Gilmore Needle*)		Soundness in Steam	Specific Gravity (Le Chatelier)	Compressive Strength 2-In. Cubes Graded Ottawa Sand (*lb. per sq. in.*)				Fineness			Specific Surface (*sq. cm. per gr.*)
									Per Cent. Passing Sieve Number			
	Initial *Hr. Min.*	Final *Hr. Min.*			1 day	3 days	7 days	28 days	200 (Dry)	200 (Wet)	325 (Wet)	
1	3:40	6:30	Sound	3.16	941	1,532	2,509	4,792	94.8	95.3	88.2	1,735
2	3:45	6:25	Sound	3.15					95.2	95.2	87.5	1,845
3	3:30	6:00	Sound	3.17	557	1,400	2,117	4,035	94.6	94.5	86.8	1,860
4	3:45	6:45	Sound		695	1,480	2,197	4,207		94.5	87.9	1,777
5	4:10	8:30	Sound	3.17	425	1,158	1,925	3,517	94.3	93.4	88.1	1,827
6	3:50	7:20	Sound	3.12	412	1,280	2,046	3,691	96.3	96.0	88.0	1,818
7	3:00	5:30	Sound	3.20	567	1,450	2,316	4,400	95.5	95.8	86.6	1,820
8	3:50	5:50	Sound	3.22	465	1,438	2,159	4,191	94.8	95.6	87.8	1,747
9	3:40	5:40	Sound	3.21	675	1,608	2,808	4,280	95.4	95.0	87.5	1,845
10	3:15	5:30	Sound		662	1,707	2,763	5,367		95.4	88.7	1,833
11	3:20	5:25	Sound	3.19	680	1,620	2,400	4,580	94.8	94.7	88.1	1,945
12	5:20	7:20	Sound	3.19	530	1,370	2,110	4,210	94.1	94.1	88.4	1,690
13	3:15	6:00	Sound	3.16	561	1,352	2,080	4,221	95.3	94.9	88.1	1,842
Average	3:43	6:22	Sound	3.18	597	1,450	2,286	4,291	95.0	95.0	87.8	1,814

Data Regarding Physical Laboratory

Laboratory No.*	Temperature (*deg. F.*)					Average Relative Humidity		Compression Machine			
	Laboratory	Mixing Water	Moist Room			Laboratory	Moist Room	Make	Type	Capacity (*lb.*)	Calibrated
			Min.	Av.	Max.						
1	72	72	69	70	71	64	94	Riehle	Screw	200,000	2-20-35
2	69-71	70									
3	78-80	70	70	70	70	53-57	95	Riehle	Screw	50,000	10-27-34
4	80	70	69	71	74	51	91	B.S.	Hydr.	75,000	Daily
5	72	71	69	70	71	69	95-100	Fischer	Hydr.	25,000	3-11-35
6	84	70	70	70	70	76	94-98	Riehle	Screw	50,000	3- 9-29
7	78	70	68	70	72	40	95	Fischer	Hydr.	25,000	12-00-34
8	70-71	71	70	70.5	71	69-70	100	B.S.	Hydr.	75,000	Factory
9	73	73	69	70	71	77	94-99	P.T.L.	Hydr.	16,000	8-17-34
10	73-75	71-73		70.5		26-44	95-99	B.S.	Hydr.	75,000	
11	69-74	68-70	68.5	70.0	71.5	5-21	99-100	B.S.	Hydr.	20,000	10-25-34
12	73	70	70	70	70	55	95	B.S.	Hydr.	75,000	12-00-34
13	72	70	68	70	72	65	95-100	B.S.	Hydr.	75,000	12-00-34

Note: P. T. L.=Pittsburgh Testing Laboratory No. 4 Model. B. S.=Baldwin-Southwark.

Summary of Chemical-Test Results

Laboratory No.*	Ignition Loss	Insoluble Residue	Chemical Analysis (*per cent.*)						Compound Composition (*per cent.*)					Fe_2O_3/Al_2O_3
			SO_3	SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	C_3S	C_2S	C_3A	C_4AF	$CaSO_4$	
1	1.35	0.41	1.81	22.15	4.71	5.33	63.09	1.32	41.0	32.6	6.1	14.3	3.1	0.88
2	1.28	0.20	1.80	22.10	4.71	5.42	62.91	1.08	39.9	33.3	6.4	14.3	3.1	0.87
3	1.28	0.40	1.80	22.14	4.81	5.77	63.30	1.00	38.5	34.5	7.1	14.6	3.1	0.83
4	1.22	0.40	1.90	22.10	4.85	5.19	62.77	1.16	40.3	33.0	5.5	14.8	3.2	0.93
5	1.27	0.37	1.76	22.06	4.71	5.49	62.82	1.08	39.3	33.7	6.6	14.3	3.0	0.86
6	1.40	0.34	1.88	21.12	4.66	5.92	63.85	0.79	47.5	24.8	7.8	14.2	3.2	0.79
7	1.46	0.30	1.87	22.14	5.20	5.30	62.60	1.24	38.4	34.5	5.2	15.8	3.2	0.98
8	1.35	0.38	1.86	22.20	4.70	5.44	63.07	0.98	39.5	33.8	6.5	14.3	3.2	0.86
9	1.35		1.85	22.25	4.60	5.55	62.70	1.15	36.9	36.1	6.9	14.0	3.2	0.83
10	1.18	0.36	1.77	22.10	4.72	5.58	63.22	1.23	40.2	33.0	6.8	14.4	3.0	0.85
11	1.20	0.34	1.84	22.04	4.92	5.32	63.21	1.28	41.7	31.8	5.8	15.0	3.1	0.92
12	1.26	0.45	1.89	22.03	4.77	5.30	62.86	0.96	41.0	33.0	6.0	15.0	3.2	0.90
13	1.28	0.40	1.85	22.20	4.78	5.56	63.04	1.24	38.3	34.8	6.7	14.5	3.2	0.86
Average	1.30	0.36	1.84	22.13	4.78	5.47	63.03	1.12	40.2	33.0	6.4	14.6	3.1	0.87

*Laboratory No. 13 is that of the Tennessee Valley Authority.

Compression tests are now made in the laboratory of the Authority by means of a hydraulic testing machine in which the rate of application of load is 2,000 lb. per sq. in. per min. for the 3-day test and 4,000 lb. per sq. in. per min. for the 7-day test.

The 2-in. cubes are made in accordance with specification requirements which are not very explicit. Tests made in the laboratory indicate that a considerable variation in compressive strength can be obtained by varying the methods of making the cubes. The operators in the Authority laboratory have endeavored to standardize their own methods of making these cubes so that they are able to compare each other's results. Tests occasionally made with other laboratories indicate that the method of making the specimens greatly affects the compressive strengths obtained. The results of such a series of tests are shown in Table II, in which the Authority laboratory is No. 13. The surface-area determinations are indicative of the state of laboratory testing for surface area at this time.

It will be noted that the fineness of cement on the 200-mesh sieve is an indication of the specific surface for this particular cement. Experience has shown, however, that whereas a fineness of 95 for one brand of cement might indicate a specific surface of 1,800, a fineness of 95 would not necessarily indicate the same specific surface for another cement manufactured by another mill, which indicates that a turbidimeter or similar apparatus is necessary for properly controlling the fineness of the cement in mill operations. It is not customary for the Authority to make the fineness determination on a 200-mesh sieve by either the wet or dry method, but this was included in this coöperative test for the purpose of comparison with the 325-mesh sieve on which the test is made regularly.

The chemical-test results on the average are quite satisfactory from the viewpoint of routine analyses; however, there is a wide divergence in some instances; see especially the MgO determination.

This wide divergence also shows up to a marked degree in the compound composition. The tricalcium silicate (C_3S) range is over 10 points and this should certainly be reduced by a more careful analysis of the oxide constituents.

Type B cement is not a cure-all for the troubles of the construction engineer, but we feel that cement purchased under such specifications for control of fineness and compound composition represents the application of the best information available, and only time can tell if its use has greatly improved the durability of the concrete structures.

Cement Problems *(from page 34)*

Modernization, too, offers promise through miscellaneous uses such as new foundations, walks, porches, driveways, retaining walls, steps, overcoating with stucco, ornamental concrete, etc.

In both the housing field and that of modernization, however, there appears the problem of marketing. In those fields the cement manufacturer obviously can not contact every individual prospective user or owner. The sales is created by the dealer, contractor, or concrete-products manufacturer, and it would therefore seem that the industry's remedy here is to find ways and means to assist dealers, contractors, or concrete-products manufacturers in making their prospective buyers familiar with the desirability and economy of concrete. This the industry is attempting to do.

In 1933 it was estimated that the farm market took approximately 12 per cent. of the cement shipped in that year. Predictions have been offered that the farmers' income in 1935 will exceed $6,000,000,000, and with such an income, together with the Federal assistance they will receive, the farmers may come back into the market and make numerous property improvements which have been neglected or postponed for a number of years. This will mean an increased use of cement.

In the foregoing reference has been made to the very obvious opportunities for the industry. An opportunity perhaps not so obvious to many is that of concrete in architecture or concrete as an architectural medium. Over a period of many years concrete has demonstrated its utility, economy and dependability as a structural material. Recent years have found progressive architects studying and making use of the material as a medium for architectural expression. This is a broad field rich in promise, and one renowned architectural sculptor has stated that "Even now, in its present state of development, concrete is an architectural material without a rival."

Color in concrete will accelerate the advance of the material as a versatile medium for architectural expression. By any one of several methods concrete may now appear in almost any desired combination of colors, and may also yield highly-ornamental effects limited only by the desire and objective of the architect or craftsman.

One problem which some may regard lightly, but which in reality is serious not only to the cement industry but to other industries which benefit from the activities of the cement industry, and particularly because labor may be affected, is the importation of cement from foreign countries. Under a recent reciprocal tariff agreement the import duty on cement, which had been inadequate, has been further reduced. As affecting wage-earners, each 1,000 bbl. of imported cement displaces 122 man-days of American labor. While there is a somewhat common impression that imported cement can affect business only at or near seaports, that is erroneous because its effect spreads out to influence adversely business far back in the interior. The remedy lies in establishing in Government circles an understanding and appreciation of the great and real injury being inflicted on American industry and labor.

As a closing thought the suggestion is offered that an ever-present problem for all in the industry is how to improve the salesmanship of our product, and by that is not meant how to improve sales technique when attempting to sell someone who already wants cement, but, instead, in the broader sense, promotional salesmanship applied intelligently and persistently to the public at large, thereby creating many new users of the product.

Lime Group Favors Voluntary Agreement to Preserve Code Benefits

Approves Program and Hopes for Adoption by Districts of Industry

THAT the lime industry derived enough practical benefits from twenty months' operation under its N.R.A. code to justify the preservation of those gains by some kind of voluntary agreement was the unanimous opinion of the lime manufacturers who assembled in Hot Springs, Va., during the week of June 17 for the seventeenth annual convention of the National Lime Assn. Without a single dissenting vote they adopted a declaration of policy seeking to perpetuate "by every means available and as far as possible the benefits which have accrued to the industry and all engaged therein from the code of fair competition of the lime industry." The convention also approved by unanimous vote a plan to submit to the industry a specimen form of industry agreement by which it is believed that this object can be attained.

The convention, which opened on Wednesday, followed two days of active discussion of the provisions that should be incorporated in such an agreement. The Code Authority of the Lime Industry, having lost its official status along with other code authorities as the result of the Supreme Court's decision in the Schechter case, before dissolving itself as of midnight June 17, appointed a liquidating committee, consisting of Messrs. S. W. Stauffer, Bernard L. McNulty, George J. Whelan, J. M. Gager and Reed C. Bye, to adjust the affairs of the Code Authority and to return all surplus funds to lime makers who had subscribed to the code and paid dues under it. Then the board of directors of the association adopted the declaration of policy referred to and drafted the industry agreement mentioned.

By the convention's adoption of that declaration the Trade Relations Committee of the association was authorized to "investigate, consider and develop practical ways and means to preserve and perpetuate the benefits of the code, and to submit to the industry at the earliest practicable date for its voluntary acceptance or rejection a plan in concrete form for achieving this end." The declaration mentions seven classes of provisions as desirable for inclusion in such a plan "so far as practically and legally possible."

(A) Such lime-code definitions as are appropriate.

(B) Continuance of the minimum-wage scales now in effect and other labor provisions conforming to government requirements.

(C) Filing with an appropriate agency of complete price lists individually arrived at, including terms and conditions of sale, and making such lists available to members of the industry.

(D) Such of the lime code's trade-practice rules as may be found desirable and acceptable to the government.

(E) Means for the voluntary enforcement of the open-price and trade-practice rules and for penalizing violators thereof by liquidated damages payable to the industry as a whole; and means for determining the facts of alleged violations and for arbitration or other procedure.

(F) An equitable plan for providing the costs of developing and administering such a plan by all industry members on a voluntary basis through binding agreements.

(G) Other "beneficial or remedial provisions" as may be suggested or developed by the committee.

The board of directors urged the industry to adhere to the code's standards respecting labor, price publication and trade practices upon an "individual and voluntary basis" until a plan can be submitted to the industry.

The "Master Agreement of the Lime Industry," as the specimen form of agreement has been named, is an outgrowth of proposed "Fair Trade-Practice Rules for the Ohio Finishing Lime Assn., the second draft of which was completed on June 12, 1935. It embodies many of the provisions of these rules, which in their turn were taken largely from the amended code of the lime industry, approved April 1, 1935, and published in PIT AND QUARRY for May, 1935, pp. 53-58. The proposed agreement differs in several important particulars from the amended lime code. It embodies in its labor provisions the privilege of averaging the hours of labor over any calendar half-year at 40 hr. a week; it contains an "optional liquidated damage clause"; it appoints the Trade Relations Committee of the National Lime Assn. as the agency for serving the members subscribing to the agreement; and it provides means for contributing to the expense of administration and for subscriptions and withdrawals. It would expire on March 31, 1936, unless abrogated sooner by those signing it.

THE convention opened with one of President Hough's characteristically forceful pleas for cooperative action designed to further the interests of the lime industry, which, he pointed out, is ready to go forward. It is "a natural-resource industry," he said, one that is "vital to the needs of our civilization and destined to play an ever increasingly important *rôle* in the life of the country." Much of the difficulty encountered in attempts to further its interests has been due to the lethargy which allowed the industry's "foundation to be washed

away, not realizing that before our industry could ever become bigger it must first become better," according to Mr. Hough.

The lime industry is better than it was a few years ago, due largely to the N.R.A. and the industry's accomplishments under its code, he said. By compliance with its provisions the industry was put on a firm basis in its bargaining activities. There were "benefits to labor, to industry and to the public," said Mr. Hough, "in spite of the defects which sprang from necessarily hasty organization." "Many of the old practices which were so depressing . . . in pre-code days," he added, "have largely disappeared, and the industry is operating on a far sounder basis than ever before . . ."

The year 1928, he reminded his hearers, was one of general prosperity but not for the lime industry. Despite a building "boom," accompanied by rising general prices, the industry was operating at an extremely low level and had been losing tonnage since 1925. Prices had been falling since 1923. The advances of competitive industries made serious inroads into the lime business, yet, because of competitive practices within the industry, little attention was paid to outside competition.

Despite the confusion created in official circles by the Supreme Court decision invalidating N.R.A. codes, said Mr. Hough, the lime industry held two meetings within 48 hours, meetings in which lime manufacturers decided to "hold their gains as long as they could, or at least until such time as new legislation could be enacted which would permit the industry to formulate definite policies."

"No matter what may be our future relation to the government, our mutual relationships are clear," he said. "I am sure that every lime manufacturer to-day has a keener realization than ever before of the problems of the industry which are common to all, a deeper sense of his responsibilities as an individual and as a member of the industry, and a greater appreciation of the direct benefits of coöperative efforts in solving our internal problems." He attributed this to the frequent interchange of thought and opinion and the dissemination of vital facts that had come about through operation under the code. There resulted a "sympathetic understanding, a meeting of minds, a harmony of viewpoints, and a unity of purpose which no court decision can or will destroy," he added.

AGGRESSIVENESS and self-confidence are badly needed by the lime industry, Mr. Hough contended. It must also leave behind it the unsound marketing practices which the code eliminated. In spite of the curtailment which followed the collapse of business in 1929, the lime industry forged ahead and pursued its constructive association activities, he said.

He described at some length the advances made in the field of mortar sales, and dwelt upon the changes of attitude toward lime in mortar that have come about among architects and builders since 1931. By some architects lime was "actually regarded as so much poison when found on a construction job," he said, while others would allow only 10 per cent. lime to be used. The lime association is now recognized "in many quarters as the place where the last word in accurate and reliable information on the mortar subject can be obtained."

Mr. Hough called attention to interior plastering as a field in which lime can be sold and cited two recent orders aggregating over 1,100 tons as evidence of the opportunities. He believes that the fire-test requirements of building codes when applied to plaster are false ideas, and that the lime industry will soon be able to show how well lime meets those tests. He referred also to the opportunities for selling lime for sewage treatment.

In conclusion he stated that the Supreme Court's decision "has thrust a large part of a great responsibility back into the lap of industry." The National Industrial Recovery Act "greatly increased the coöperative consciousness of industry." "Wholesome coöperative effort among competitors," he said, "offers the only way to a large business, a better business and satisfactory profits. . . . Either competition will fall to the level of vicious fighting and trade demoralization or it must adopt a practical plan of coöperation. Men working together sincerely for a common end can so organize their energies that problems fade before them. It is then, and only then, that the individual prospers the most."

SOME of the possibilities of coöperation between producers under the eye of government were examined by Abram F. Myers, counsel of the association. Speaking on *The Future of Industry Coöperation Under Government Supervision* he drew attention to the fact that the type of industry coöperation wherein the industries wrote the rules and the government undertook to enforce them has received a "body blow." "For two years," he said, "under N.R.A. industry experienced what it had long sought and thought it wanted," and added that "the principal gains under N.R.A. were the direct results of the contributions of the industries themselves."

The success of the lime industry's code was due, in his opinion, to the "restraint, self-discipline and will to obey manifested by members of the industry." He credited that restraint to the "deep-seated conviction that the coöperative measures provided in the code were for the good of each subscribing member and the industry as a whole."

Included in the portions of Title I of the National Industrial Recovery Act which were extended until April 1 of next year are the portions of Sec. 4 (a) authorizing the President "to approve voluntary agreements between and among persons engaged in a trade or industry . . . relating to any trade or industry, if in his judgment such agreements will aid in effectuating the policy of [the act] with respect to transactions in or affecting interstate commerce," Mr. Myers pointed out. "As in the case of the codes," he added, "these voluntary agreements must be consistent with the requirements of Clause 2 of sub-section a of the act providing that they "shall not be designed to promote monopolies or to

eliminate or oppress small enterprises and will not operate to discriminate against them . . ."

The Borah amendment to the act extending the old law provides that the exemption from the anti-trust laws provided by Sec. 5 of Title I "shall extend only to agreements and action thereunder (1) putting into effect the requirements of Sec. 7 (a)" [the collective-bargaining clause], "including minimum wages, maximum hours and the prohibition of child labor; and (2) prohibiting unfair competitive practices which offend against existing law, including the anti-trust laws, or which constitute unfair methods of competition under the Federal Trade Commission Act, as amended." Mr. Myers pointed out, when quoting this amendment, that it does not prevent the President from approving industry agreements "which go beyond Sec. 7(a) and the Group I rules of the old Trade-Practice Conference procedure."

"During our two years' experience under the N.R.A. many constructive and desirable agreements and practices, formerly regarded as in the twilight zone of the law, have come to be regarded as necessary and proper in the public interest," Mr. Myers said, and "there is no reason why the President should not approve as parts of an industry agreement provisions which have worked successfully and satisfactorily as parts of approved industry codes."

Industry has made progress under N.R.A. in convincing government representatives and the public that the fair trade practices which industry has sought are not contrary to the public interest. "Senator Couzens," said Mr. Myers, "asserted, without contradiction, that price filing was not tantamount to price fixing. In the House it was conceded that liquidated-damage clauses could be embodied in the voluntary agreements."

Mr. Myers urged his hearers to adopt the proposed voluntary agreement despite its tentative character in the nature of a "stop-gap." "You must carry on now," he said, "or all the benefits you have gained will be lost. . . . You must demonstrate that you have the character to curb your own cupidity to the extent necessary to make a success of this undertaking. You must cease calling for the 'cops' and police your own industry. If you again call on the government, it will move in and stay, and you will have something very much worse than you have ever had in the past."

FURTHER discussion of some of the legal aspects of voluntary agreements was led by William H. Davis, formerly national compliance director of the N.R.A., who presented a paper on *Voluntary Compliance and Enforceable Fair Trade Practices.* He enumerated the benefits derived from operation under the N.R.A. lime code as: (1) The minimum labor standards; (2) the elimination of business practices that would be generally characterized as oppressive or unfair, abuses which are attended by fraud or coercion or the misappropriation of what equitably belongs to a competitor; (3) rules of conduct agreed to by the industry, recognized as desirable and helpful for the well-being and prosperity of the industry—reasonable restraints of competition which do not prejudice the public interest by unduly restricting or unduly obstructing the course of trade; and (4) the collection and dissemination of industry statistics.

MR. DAVIS voiced his agreement with the opinion of Justice Cardozzo, expressed in the Schechter case, when he said that to take from a code the provision as to wages and hours of labor is to destroy it altogether. Mr. Davis said that "certainly no sound competitive conditions can be maintained in the face of competitive wage cuts." "The support of public opinion and political support are substantially dependent upon the wage, hour and minimum labor standards," he added. These standards bring employers and employees together, whereas their absence may place them in antagonistic positions. He said that the joint resolution recently approved by the President makes agreements putting into effect the requirements of Sec. 7 (a), including minimum wages, maximum hours, and the prohibition of child labor, exempt from the provisions of the anti-trust laws.

He urged that such agreements be extended to the employees themselves, "since departure from minimum labor standards generally accepted in an industry is . . . an unfair method of competition," and that the coöperation of the workers in making them effective be encouraged.

He suggested the creation of some kind of "minimum-labor-standards board" in the industry for determining these provisions, for policing them, and for considering proposed amendments and pleas for exemption in special cases. He admitted that this implied some "minimum organization of the workers in the industry," a result which he believes to be not only inevitable but desirable. "It is only through some sort of organization of industry that the force of economic laws can be brought to bear upon the worker," he said. The right of the employee to self-organization for collective bargaining was "recognized by the Federal government in the Coolidge administration in the original Railway Labor Act, . . . twice under the Hoover administration in the Anti-Injunction Act and the Bankruptcy Act, and . . . twice in the Roosevelt administration in the N.R.A. and in the amended Railway Labor Act." He drew attention to the fact that the President had announced, and that there had been introduced into the Congress, proposed legislation to limit government purchases to persons who comply with minimum labor standards and to apply the same rule to the use of government loans and grants to states and municipalities, as evidence of the administration's determination not to lose any of the gains that had been achieved by N.R.A.

Mr. Davis thought that voluntary agreements should include provisions for the use of insignia, or certificates of compliance, by those who abide by the rules.

On the subject of competitive methods within the meaning of the Federal Trade Commission Act Mr. Davis stated that the Supreme Court has said that the words "unfair competition" or "unfair methods

of competition" in that act have a wider meaning than the old sense of "acts tainted by fraud or coercion or misappropriation of what equitably belongs to a competitor, such as disparagement of a competitor or his goods, obstructions of a competitor's customers, false advertising, appropriation of trade-marks, trade-names and trade-words falsely describing location or product, commercial bribery, misrepresentation of quality, adulteration of goods, interference with source of supplies, local price-cutting to drive a competitor out of business, unfair comparison of prices, competition actuated primarily by malice or revenge, and so forth." The scope of the act must be left to judicial interpretation as the controversies arise, the court has said, and these controversies are to be determined in particular cases upon the evidence in the light of particular competitive conditions, and of what is found to be of specific and substantial public interest. Mr. Davis believes that the Federal Trade Commission learned much from the experience with N.R.A. and that, if approached on the subject now, would display "a more liberal attitude" than before. "The doubt, or any question of doubt, as to whether they have jurisdiction of a particular practice will," he thinks, "be resolved in favor of the exercise of jurisdiction, where before it was resolved against it." He added that there is already some evidence of this change.

THE amended N.R.A. provides exemption from the anti-trust laws for voluntary agreements prohibiting unfair competitive practices, that is "unfairness in the sense of crookedness, or malice, or deceit, concealment of things that will bring the business of the industry out into the open where everyone can see it," he said. Referring to trade practices that can not be so classified, he quoted Justice Cardozzo in the Schechter case. "By this other conception a code is not to be restricted to the elimination of business abuses and practices that would be characterized by general acceptation as oppressive or unfair. It is to include whatever ordinances may be desirable or helpful for the well-being or prosperity of the industry affected. In that view the function of its adoption is not merely negative, but positive."

"Whether a particular rule of conduct is of the enforceable Federal Trade Commission type, or of the voluntary and unenforceable, positive-improvement type, is not easy to tell," Mr. Davis admitted. But he believes that there has been a "revolutionary change in the atmosphere surrounding that question."

Industries will press for the continuation of practices that were found advantageous under N.R.A., said Mr. Davis, and here, too, with respect to violation of anti-trust laws, the Supreme Court has said that the line between what will be prohibited and what will be permitted does not admit of precise definition. Although the Supreme Court "indicated very definitely, even after the 'rule-of-reason' decision in the Standard Oil case, that it would not apply the rule of reason as to become itself an administrator of the law in the sense of determining what was good for business and what was not," Mr. Davis believes that this is no longer true. He quoted the court's decision in the Appalachian Coals case, wherein it said: "The purpose of the Anti-Trust Act is to prevent undue restraints of interstate commerce, to maintain its appropriate freedom in the public interest, to afford protection from the subversive or coercive influences of monopolistic endeavor." To which it added that the legality of an agreement under the act "can not be determined by the simple test that it restrains competition," because the question is whether the restraint is unreasonable or undue and contrary to the public interest and this must be determined by the facts in each case, the conditions existing in the industry and the purpose of the agreement.

The court said further:

"The unfortunate state of the industry would not justify any attempt unduly to restrain competition or to monopolize, but the existing situation prompted defendants [the coal producers] to make, and the statute did not preclude them from making, an honest effort to remove abuses, to make competition fairer, and thus promote the essential interests of commerce."

Mr. Davis quoted further from the decision wherein it was said that "a coöperative enterprise, otherwise free from objection, which carries with it no monopolistic menace, is not to be condemned as an undue restraint merely because it may effect a change in market conditions, where the change would be in mitigation of recognized evils and would not impair, but rather foster, fair competitive opportunities. . . . The fact that the correction of abuses may tend to stabilize price levels does not mean that the abuses should go uncorrected or that coöperative endeavor to correct them necessarily constitutes an unreasonable restraint of trade."

He suggested as a means to finding an answer to the question of legality "short of a protracted law suit," the creation of a board or commission "empowered to say that in its opinion a certain practice, voluntarily agreed to by members of an industry, does not violate the anti-trust laws, that . . . in its opinion it is a reasonable and not an unreasonable restraint, that it is not discriminatory, but leaves equal opportunity to all, that it is not monopolistic, and that it tends to the public interest."

SUCH a board, in Mr. Davis' opinion, should record facts and make its findings on that basis and adopt a procedure similar to that of the Federal Trade Commission. The ultimate determination of the legality of any proposed rule would still remain in the courts, subject to an injunction but with no penalty or criminal prosecution, he said. In his opinion the board would be required to find, in order to approve it, that the proposed rule is reasonable restraint, which does not prejudice the public interest by unduly restricting competition, or unduly obstructing the course of trade, to which could be added the requirement that the rule will not only not create a monopoly or monopolistic practices or

discriminate against individuals but will tend to preserve a free market in which there is free competition among buyers as well as among sellers.

Mr. Davis asserted that the test for determining which transactions affect interstate commerce directly and which affect it indirectly should be the public interest. The effect of both the anti-trust laws and the Federal Trade Commission Act is to "impose a public interest on any common agreement among industrialists."

PUBLIC interest is, in Mr. Davis' opinion, "equal opportunity for all, and special privilege to none." In the lime business the public interest is "that the consumer should be able to get lime when he wants it, for all the purposes for which it is usable, of good quality, at a reasonable price." A reasonable price he defined as a "stabilizing" price. The proper price he described as the one "that permits the industry to go ahead, furnish its materials of good quality, at the right price, all the time, and make a reasonable profit that will attract investment and human energy."

A board such as Mr. Davis suggested, having approved a rule of conduct, and that rule having been put into effect by voluntary agreement and having been in effect long enough to develop actual recorded facts, could examine these facts and, finding that the failure to comply with that rule by the minority is actually and immediately destructive of interstate trade, could record that finding (as the Federal Trade Commission does) and could issue a cease-and-desist order (as that commission does). Such a finding would be reviewable by the courts but would not be subject to criticism on the ground of constitutionality, Mr. Davis predicted.

The collection and publication of industry statistics by trade associations has been approved by the Supreme Court in the Maple Floor Covering Manufacturers case and in the cement case, Mr. Davis said. He quoted from the court's decision as follows:

"Trade associations or combinations of individuals or corporations, which, as in this case, openly and fairly gather and disseminate information as to the cost of their product, the actual prices it has brought in past transactions, stocks on hand and approximate cost of transportation from the principal point of shipment to points of consumption, and meet and discuss such statistics without reaching or attempting to reach any agreement or concerted action respecting prices, production or the restraining of competition, do not thereby engage in an unlawful restraint of commerce."

The court said also, according to Mr. Davis:

"Persons who unite in gathering and disseminating information in trade journals and statistical reports on industry; who gather and publish statistics as to the amount of production of commodities in interstate commerce, and who report market prices, are not engaged in unlawful conspiracies in restraint of trade merely because the ultimate result of their efforts may be to stabilize prices or limit production through a better understanding of economic laws and a more general ability to conform to them, for the simple reason that the Sherman law neither repeals economic laws nor prohibits the gathering and dissemination of information. Sellers of any commodity who guide the daily conduct of their business on the basis of market reports would hardly be deemed to be conspirators engaged in restraint of interstate commerce."

In closing, Mr. Davis referred to the prerogative of government interference as expressed by the President some two years ago, and quoted him thus:

"The government ought to have the right, and will have the right, after surveying and planning for an industry, to prevent with the assistance of the overwhelming majority of that industry, unfair practice, and to enforce this agreement by the authority of the government. The so-called anti-trust laws were entered into to prevent the creation of monopolies and to forbid unreasonable profit to those monopolies. That purpose of the anti-trust laws must be continued, but these laws were never intended to encourage the kind of unfair competition that results in long hours, starvation wages, and overproduction.

"One of the great restrictions upon such coöperative effort up to this time has been our anti-trust laws. They were properly designed as the means to cure the great evils of monopolistic price fixing and should certainly be retained as assurance that the old evils shall never return, but the public interest will be served if, with the authority and under the guidance of the government, private industry is permitted to make agreements and codes insuring fair competition."

THE lime industry's safety contest was discussed by the association's statistician, Paul Hatmaker, who reported that the lime industry had been making progress in accident-prevention. The frequency rate for 1934 was 44.489 as compared with 67.3 for 1933, a decrease of approximately 34 per cent. in the number of accidents per 1,000,000 man-hr. The accident severity rate in 1934 fell to 2.217 days lost per 1,000 man-hr. of employment from the 1933 figure of 5.1. These results, Mr. Hatmaker said, indicated the presence of "better working conditions in the industry during 1934, better coöperation by management with employees, and certainly a greater degree of interest in safety work."

The level of accidents in the lime industry is still too high, however, he said, pointing to the cement industry's frequency rate of 6.38 compared with the lime industry's rate of 44.489.

He then discussed the safety contest, which was designed to correct this condition. The rules were published in the June issue of PIT AND QUARRY, p. 23. He said that 31 plants had enrolled by June 15. Company executives, he asserted, "are responsible not only to the capital invested in the quarry and the plant, but to the men employed and to their families." He emphasized the fact that accident prevention yields rich dividends "both in the form of lower costs of operation and higher *morâle* of employees, as well as a great decrease in human suffering, which can not be measured in terms of dollars."

Wharton Clay, special assistant in the Industries Division of the Federal Housing Administration, discussed *What the National Housing Act Means to the Lime Industry.* He called attention to the fact that the Federal Housing Administration is a permanent government agency and that its efforts are not, therefore, limited to the time-field of recovery measures.

Title I of the Federal Housing Act as originally enacted provided for loans up to $2,000 for modernizing and home improvements in any type of property, Mr. Clay explained, the loan being covered by a simple note between the borrower and the lender, the government insuring the loan. The responsibility for activity rests on the banks or other lending agencies, but if they delay, the government will act, he said.

Title I, as amended, increases the amount that can be borrowed to $50,000, and permits improvements to manufacturing and processing plants of all kinds, provided these can be construed as fixed improvements to real estate. The discount rate is $5 per $100, but the government hopes to be able to reduce this. The government insures the aggregate lendings of the banks amounting to 20 per cent. of the total, Mr. Clay declared. The success of the plan depends on the building industry and the banks.

In Mr. Clay's opinion the success of the lime industry depends on an increasing use of lime for masonry and plaster, and the Federal housing plan is the means of widening the opportunities for using lime in both fields.

The second part of the act reforms the mortgage situation by abolishing the 20-hr. and 30-yr. amortized loans. New loans must be amortized monthly.

There are more than 6,000 cities in which citizens have been organized to promote a revival of building, Mr. Clay said. Building activity has already risen from 30 to 60 per cent. of the 1930 level, he quoted Dun's and Bradstreet as having reported. In some cities, he added, the loans already made for improvements under the Federal Housing Act average $10 per capita.

ON the last day of the convention those in attendance were entertained and instructed in the use of lime as a "sweetener" of acid soils by the presentation of an AudiVision dramatization in voice and picture, entitled *The Sweet Earth—Redeeming the Soil.* It consisted of a series of still pictures accompanied by recorded conversation synchronized with the subjects portrayed.

In commenting on the possible uses of this method, Henry A. Huschke, manager of the Agricultural Dept. of the lime association, told numerous incidents illustrating the interest-arousing power of the presentation. At one showing at a farm auction 250 persons attended and remained throughout the performance, and a second showing, made immediately thereafter and in competition with the pleas of an auctioneer, drew an audience of 150 people. In 10 days the presentation was shown to 630 people in 8 audiences.

Mr. Huschke suggested that lime manufacturers purchasing the film and record should work with a good dealer in each town to get the picture before neighboring farmers. He suggested, too, that bankers be invited to attend. The projecting machine can be bought or rented, in some of the latter cases from Ford dealers who use similar equipment. The showings must be made by lime manufacturers, as the association staff can not undertake this work, Mr. Huschke said.

President Hough suggested the use of the same idea and method in promoting the use of lime in the building industry and in water-softening. The association would pay for the productions, as in the first case, and sell the films to lime makers.

THE value of research in the lime industry was discussed by Walter C. Voss, professor of building construction, Massachusetts Institute of Technology. He suggested that "the only safe course for any industry to take in these days of dynamic industrialism is one that avails itself of every possible avenue for improvement and study with the long-range, telescopic view of future prospects as yet unrealized." But it should keep in mind "a service to the public as the yardstick of successful accomplishment," he added.

He described some of the results of the work carried on by him at the institute during the last few years on behalf of the lime industry and with funds supplied by the lime association. These studies related to the basic influences surrounding mixtures of lime and cement when used as mortar in brick-masonry walls. The physical characteristics which should be possessed by a building unit to produce a reasonably water-tight assemblage in the wall were studied by physical tests. Mortars, ranging in content from cement and sand without any lime to lime and sand without any cement, were carefully studied, and last year the volume changes which occur in the mortars usually specified were examined.

"Specimens have been made, using 1 part of cement to 2½ parts of sand with 10 per cent. of lime by weight up to the cement; 1 part of cement, 1 part of lime and 5 parts of sand; 1 part of cement, 1½ parts of lime and 6¼ parts of sand; and 1 part of cement, 2 parts of lime and 9 parts of sand," Mr. Voss said.

Building units and the mortars have been assembled "to study the amount and extent of bond, using a test specimen which places the mortar in direct tension." Mr. Voss asserts that what he calls the interfacial layer of mortar directly in contact with the brick is some form of calcium hydroxide, "perhaps not the same form as we have in our slaked lime or hydrated lime, but, nevertheless, a chemical twin of this same material."

According to Mr. Voss, his studies show that the compounds formed by the hydration of Portland cement are "isotropic" and "appear under the microscope as a dark gray and somewhat opaque substance," while compounds of calcium hydroxide or calcium carbonate (limestone) appear under the microscope as "birefringent," are "highly reflective to light and appear as a definite pearly structure."

"Where high-cement-content mortars are used evidences of this highly birefringent bond layer are absent or small in extent," he said, and when absent, "the mortar has often separated completely from the brick." He attributed this separation to a "destructive differential volume change which left a capillary plane that might later allow the entrance of water." A condition of this kind "is rarely present where higher proportions of lime are used in the mortar," he said.

THE contact between the mortar and the brick at the interfacial plane must not only be sufficient to produce strength but must be continuous and "as nearly over the entire surface as possible," if watertightness is to be obtained," said Mr. Voss. "Although we are interested in the strength of the bond we are more primarily concerned with the completeness of the bond. This is very important as we have found that the leakage through assemblages, where reasonably good brick and mortar are used, is not through the mortar or the brick, as such, if these remain intact, but through a ruptured interfacial capillary plane which is so small in dimension that it can not be detected by the naked eye, but which induces such tremendous capillary suction that it carries water directly into the wall through the entire length of the brick contact with the mortar."

He spoke, too, of the possibility of the formation of water planes at this "critical juncture," because of "insufficient absorption on the part of a dense brick," or the "robbing of the mortar of the moisture necessary to complete its functions by the high and rapid absorption of too porous a brick. The first danger may be present in either high-cement or high-lime mortars, and must be guarded against when brick are selected for a project." The second danger may be eliminated, according to him, either by using only brick whose absorption does not exceed 10 per cent. where lower-lime-content mortars are used, or by "resorting to higher lime contents in the mortar in order to get the advantages which lime has introduced, namely that of water-retaining capacity."

Mr. Voss then spoke of the problem of differing rates of expansion and the resulting shearing stresses produced in the plane of contact. Temperature and moisture, he explained, are the stimuli causing expansion and contraction in brick-and-mortar assemblages. He has found the unit difference between the two materials in the matter of expansion and contraction under high and low temperatures "slight when compared with the differentials developed in connection with wetting and drying." Carefully-prepared mortar beams were cured in a moist room for 28 days and then kept in a temperature-controlled room wherein the relative humidity was 45 per cent. and the temperature constant at 75 deg. F. After measuring the volume changes which occurred during that period, the beams were put through cycles of wetting and drying to determine changes in length. "During the wetting," said Mr. Voss, "all the specimens rapidly increased in length, the curve flattening out at quite an early stage, and after immersion in water for 3 days the specimen was allowed to dry out in the control room for a period of 11 days with the result that the specimen was again reduced in size."

From these investigations Mr. Voss concludes that "a high-lime mortar will be stabilized at a much earlier age than a high-cement mortar. This factor becomes quite important when one remembers that a sufficient amount of time elapses to cause the considerable hardening of the cement and perhaps too much to afford the mortar opportunity to repair any breaks either within itself or at the plane of the brick after such a rupture has occurred. In the case of high-lime mortar, however, it is a well-known fact that a sufficient amount of activity remains latent to adjust itself after such a lapse of time. The possibilities of irreparable rupture are thus considerably more remote where high-lime mortars are used."

Determining the "critical point at which lime makes itself felt as an advantage in mortar" is a form of investigation that must be continued, using all the proportions of lime and cement and carrying on the work "over a much longer period," according to Mr. Voss. He proposes for this purpose to make special brick with "as nearly a controlled capillary structure as possible," after which, having found a mortar with the same rate of expansion and contraction, the brick and mortar can be assembled for testing. He asserted that walls must be built on facts and not opinions if one is to prevent the situation in which the same specification produces good results in one case and poor results in another.

THE lime manufacturers assembled reëlected the following officers: Norman G. Hough, president and general manager; W. V. Brumbaugh, secretary and assistant treasurer; and R. P. Wilton, treasurer. S. W. Stauffer was reëlected chairman of the board of directors, which includes the following members: Dist. 1, C. C. Loomis; Dist. 2, S. Walter Stauffer; Dist. 3, R. C. Noll and Alexander M. Tyree; Dist. 4, James H. McNamara; Dist. 5A, George J. Whelan; Dist. 5B, Russell Rarey; Dist. 6, Gordon W. Hughes; Dist. 7, G. H. F. Johannes; Dist. 8, Miss M. E. Squire; Dist. 9, Henry La Liberte; Dist. 10 and 11, Warren Lewis; Dist. 12, J. F. Pollock; Dist. 13, Cecil R. Haden; Dist. 14, John B. McMillin; Dist. 15, R. E. Tremoureux.

The Technical Committee consists of S. Walter Stauffer, J. M. Gager, Reed C. Bye, George J. Whelan and Bernard L. McNulty.

President Hough presented the budget for next year's association work which was unanimously approved by those present. He also offered and explained a budget of the estimated cost of administering the voluntary industry agreement as a program independent of the association's activities. It was estimated that a levy of 1/10c. per ton of output would provide sufficient revenue. This budget and basis of assessment were also approved without a dissenting vote.

Electrical Testing and Control Devices Reduce Cost of Purchased Power

By J. E. McILVENNY
Electrical Department, Bessemer Limestone & Cement Co.

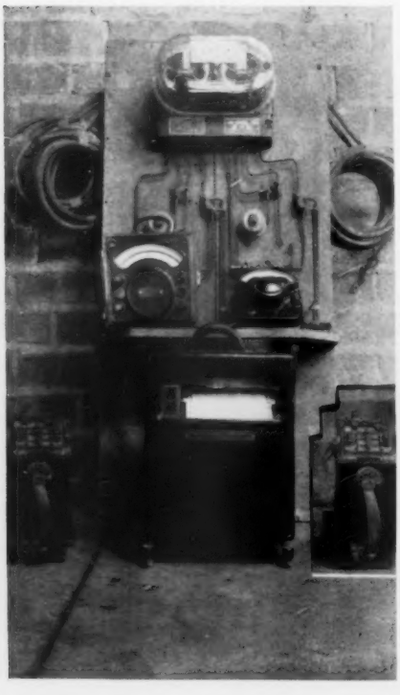
THE methods employed by one company in getting the most value for its power dollar should be of the greatest interest to those concerns who purchase all or part of their power requirements under the usual type of public-utility contracts.

The Bessemer Limestone & Cement Co. has its plant and quarries at Bessemer, Pa., where it produces cement-furnace fluxing stone and commercial stone. This company also furnishes the raw material for the operation of two brick-manufacturing plants of the Metropolitan Paving Brick Co. The amount of limestone produced annually is approximately 800,000 tons—320,000 tons produced as furnace flux, 120,000 tons as commercial stone, the remainder of 360,000 tons going into the manufacture of 1,500,000 bbl. of cement. The brick plants produce 55,000,000 bricks annually.

While these plants are located in a district where the cost of power is not low, the management has felt that the installation of power-generating equipment is not advisable even with the possible savings due to the use of waste-heat boilers. As power is a major item of expense in the operation of these plants it has received very careful analysis by the management, with the result that it is purchased on the most advantageous schedule available and is used in the most efficient manner.

In order to get this efficiency it is necessary to have an assortment of electrical instruments that will show exactly where the power is being consumed and the efficiency of the machine using it. The Bessemer company has in use almost every type of test instrument which may be needed. In addition to the usual permanent meters this company has portable ammeters, voltmeters, wattmeters, and power-factor meters with the necessary accessories which enable all the data on any motor from 1 hp. to 900 hp. to be accurately measured. Included in this equipment are the portable a.-c. recording voltmeter, ammeter, and wattmeter. This portable equipment, while very expensive, has proved to be indispensable in getting the most for the power dollar and in eliminating electrical trouble. The portable recording instruments are of Westinghouse manufacture, as are the current and potential transformers. The indicating meters used are General Electric and the combination integrating meter from which energy, demand and power factor can be computed is made by the Sangamo Electric Co.

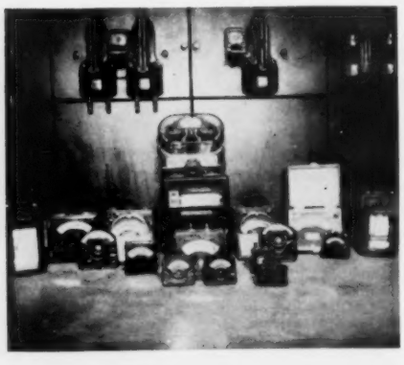
By combining the power requirements of the Bessemer Limestone & Cement Co. and the Metropolitan Paving Brick Co. a more uniform load and, of course, at a higher demand in kw. was had than was possible by each having its own separate load. This enables the two concerns to share in the savings resulting from purchasing power in the higher block of energy and demand.



Left.—The a.-c. recording instruments, showing some mounted on a portable panel.

Right.—The capacitor which saved $3,256 in 1934 and $1,887 in the first 5 months of 1935.

Below.—All the testing equipment used by the company in its control of power costs.



The plants have a total connected load of 11,907 hp., of which 5,628 hp. is in induction motors and 6,279 hp. is in synchronous motors. The synchronous motors vary in size from 25 hp. to 900 hp. There are 3,800 hp. of synchronous motors connected to loads by means of magnetic clutches, thus making them available for operation with leading power factor when loads are off. There are seven 500-hp. Allis-Chalmers synchronous motors driving No. 726 Compeb mills through 60-in. Cutler Hammer magnetic clutches, and one 300-hp. motor of the same make, so connected to a No. 722 Compeb mill. All these motors are equipped with General Electric control. The 900-hp. motor is an Allis-Chalmers machine, having slip-ring starting and synchronous running. It is equipped with Cutler Hammer full automatic control. This machine is direct-connected to an Allis-Chalmers No. 8745 Compeb mill. All synchronous motors of 150 hp. and under are General Electric with full automatic control. There are 20 of these motors which are used to operate Wilfley slurry pumps, Ingersoll-Rand compressors, Fuller-Kinyon cement pumps and various fans.

This company also operates a Model 125 Marion electric shovel which was installed in 1926. This unit loads stone at a power cost of less than .51 kw.-hr. per ton. This piece of equipment is powered and controlled by General Electric apparatus and the electrical maintenance on this shovel is extremely low.

The highest measured 15-min. demand during the past four years was 5,871 kw., with a monthly energy consumption of 3,517,408 kw.-hr. The lowest measured 15-min. demand was 197 kw., with an energy consumption of 60,908 kw.-hr.

All the plants except the quarries are located within a half-mile radius of the cement plant, which uses 90 per cent. of the total power, and therefore all can be economically served with power at 2,300 v. Power is purchased from the Pennsylvania Power Co. at 66,000 v., 3-phase 60-cycle, stepped down to 2,300 v. and distributed through a joint central substation, located at the cement plant, to the other plants. Each plant is, of course, metered at this substation and the costs divided accordingly.

The Bessemer company purchases power, as do most large consumers, on a yearly contract and the bill is rendered monthly. In normal periods of operation the total bills run from $20,000 to $30,000 per month. This bill is the total of energy charge or cost for the number of kw.-hr. plus the demand charge or cost for the highest average kw. of demand in 15 min. for the month corrected for power factor.

The method of correction is this. For a power factor below 75 per cent. the demand billing is increased in the ratio that 80 bears to the actual power factor in per cent., while for a power factor above 85 per cent. the demand billing is decreased in the ratio that 80 bears to the power factor in per cent. It is possible to control both parts of the bill to some extent by control of the power factor of the system, and the method used by the Bessemer company and the results obtained therefrom may be of interest.

The effect of the power factor may be more readily seen when a load of 3,600 kw. with a power factor of 95 per cent. gave a demand billing of 3,032 kw. with 1,558,544 kw.-hr., which made a total bill of $15,279.63, and the same load with a 90 per cent. power factor gave a demand billing of 3,200 kw. with a total cost of $15,667.63, a difference of $388.29.

At first it was indicated that running the synchronous motors, that were equipped with magnetic clutches, as condensers when their loads were off would raise the system power factor and thus decrease the demand billing. This practice is common and in some instances may result in a saving, but in order to be certain the Bessemer company made use of its test instruments. The motor manufacturer also furnished curves of a motor's performance. The test instruments showed that a 500-hp. synchronous motor running without load and fully excited used 27.6 kw. without allowance for line and rheostat losses. This amount was slightly higher than that given by the manufacturer. The operation of this motor cost $198.72 per month for the energy consumed, plus the additional charge for the demand which amounted to $33.12, or a total of $231.84. During the shut-down period this figure of $231.84 was nearly doubled as the cost of energy and the demand for lower amounts of power were considerably higher. The corrective effect was 150.4 kv.-a., which was considerably below the figure given by the manufacturer. To offset this cost of $231.84, the metering equipment showed that this motor tended to raise the power factor by correcting for 108,288 reactive kv.-a. hr. This was figured against power bills for various months having dif-

POWER-BILL SUMMARY WITH RELATION TO CAPACITOR

Year and Month	Kw. Hr.	Reactive Kv.-A.	Power Factor	Measured De. (*kw.*)	Actual Bill	Bill with Capacitor*	Capacitor Saving*
1933							
Jan.	102,286	108,000	83	266	$1,348.62	$1,048.62	$300.00
Feb.	72,498	114,000	73	273	1,181.24	1,083.70	97.54
Mar.	63,906	180,000	54	228	1,183.02	966.74	216.68
Apr.	71,813	186,000	52	328	1,512.82	1,113.28	399.54
May	1,978,304	672,000	95	3,784	17,739.18	17,510.24	228.94
June	1,412,109	720,000	90	2,360	12,388.75	12,083.12	305.63
July	1,389,890	702,000	90	2,260	12,072.01	11,827.02	244.99
Aug.	1,424,294	624,000	92	2,256	12,135.04	11,901.59	232.75
Sept.	1,391,857	564,000	93	2,224	12,063.69	11,716.68	347.01
Oct.	140,219	144,000	80	407	2,113.88	1,844.34	269.54
Nov.	698,043	150,000	98	1,313	6,644.43	6,414.20	320.23
Dec.	115,840	30,000	99	516	2,159.92	1,704.55	455.37
1934							
Jan.	63,960	18,000	99	198	1,345.35	959.90	$385.45
Feb.	60,872	30,000	97	205	1,221.39	939.23	282.16
Mar.	74,612	36,000	96	265	1,524.93	1,064.65	460.28
Apr.	1,180,441	294,000	97	2,288	10,991.30	10,742.80	248.50
May	2,141,807	408,000	98	3,333	17,606.51	17,477.21	129.30
June	1,232,388	396,000	96	2,278	11,321.99	11,027.89	294.10
July	1,159,064	354,000	96	1,998	10,374.30	10,122.82	251.48
Aug.	1,240,701	342,000	97	2,278	11,312.21	11,025.61	287.10
Sept.	1,316,036	372,000	96	2,262	11,605.68	11,416.15	189.53
Oct.	1,403,628	378,000	97	2,288	12,099.73	11,858.74	240.99
Nov.	1,330,697	324,000	97	2,232	11,570.29	11,387.79	182.50
Dec.	1,222,555	306,000	97	2,108	10,915.56	10,610.18	305.38
							$3,256.77
1935							
Jan.	73,663	36,000	98	309	1,578.84	1,105.82	$473.02
Feb.	63,536	12,000	100	292	1,491.65	1,003.65	488.00
Mar.	77,860	24,000	99	356	1,717.10	1,202.77	514.33
Apr.	189,164	72,000	96	836	2,955.60	2,695.06	260.54
May	1,498,565	270,000	98	2,852	13,491.48	13,340.11	151.37

*The savings in 1933 up to and including October are estimates. The capacitor was installed in October, and the amounts for the succeeding months are the results of metering.

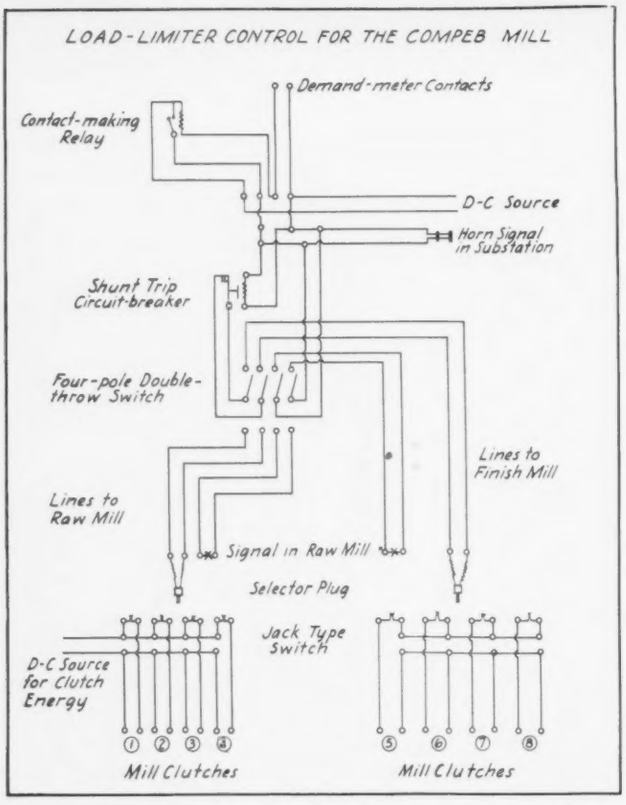


Diagram illustrating use of load-limiter control of the 500-hp. mill motors.

ferent load conditions and it was found that in every case it was costly to operate this motor to correct power factor due to the high losses. Unfortunately no chart or graph can be drawn that will show the relation of these data to the bills due to the many variables involved.

From these data it was seen that a capacitor would be the correct device to correct the condition, and the size was determined by the following method. During the months of complete shut-down of all operations except for packing cement, operating the necessary water pumps and lighting, the demand varied from 228 kw. at 54 power factor to 328 kw. at 52 power factor. It was therefore decided to add 300 kv.-a. in capacitors to the line with the expectation of a power factor of above 90 as the result.

The estimated saving on the power bill was put at $275 per month for shut-down periods with a widely-varying amount for operating periods. The fact that the savings exceeded the estimates was due to conservative estimates and to the fact that during shut-down periods, when the supply voltage is high, the capacitor exceeded its rating by 8 per cent.

The accompanying table gives the actual results from the installation of this capacitor equipment. All the figures since October, 1933, are the results of accurate metering and are not in any sense estimates. While the savings are credited to the capacitor, the metering and testing equipment should at least be credited with a sizable portion.

The capacitor installed cost $2,745 plus installation charges of $42.00, and from the table it can be seen that in 9 months it paid for itself and is earning 1,174 per cent. annually. This capacitor is a 300-kv.-a. unit manufactured by General Electric Co. It is mounted in a 400-kv.-a. frame, so that if additional correction should be necessary, it can be very easily and cheaply added.

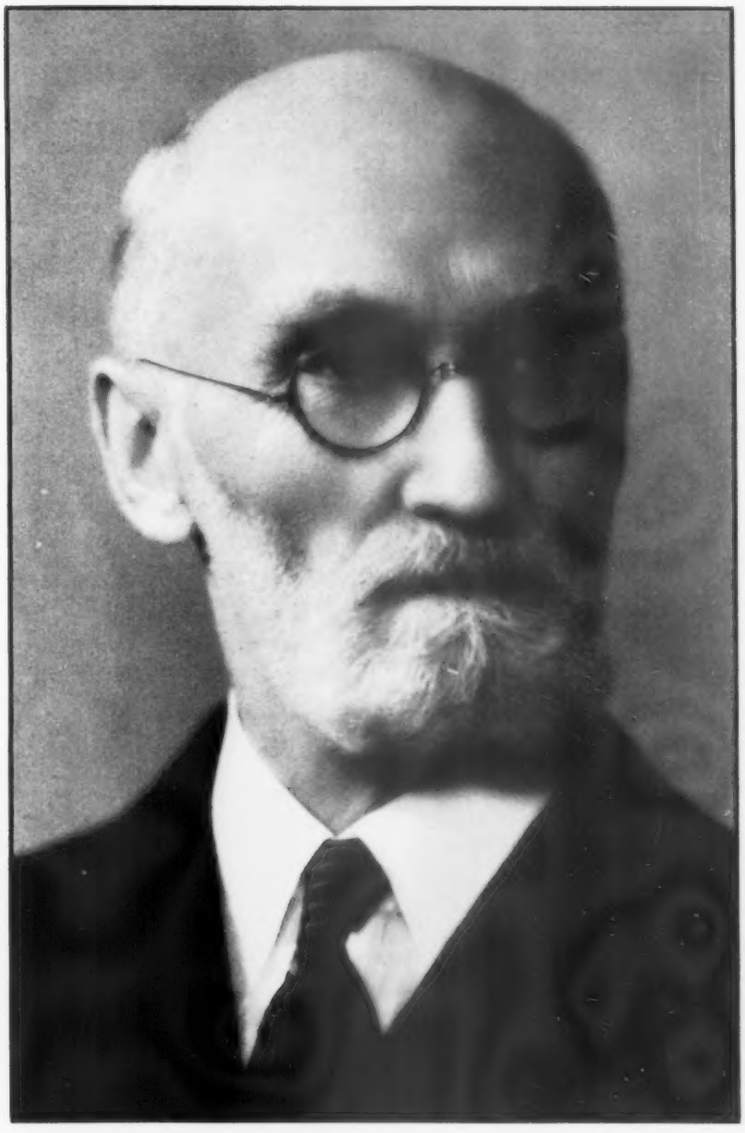
In line with its policy regarding power-factor saving, the company installed a new 300-hp. 80-per cent, synchronous motor on May 1, 1935, driving a hammer-mill. The additional cost of this type of motor over the usual induction motor is justified in the saving of $51.00 per month on the demand charge plus the additional advantage of raising the power factor on a circuit which before had a very low power factor of 56 per cent. This motor is a 300-hp. .8-per cent. Allis-Chalmers machine with a full automatic push-button control by General Electric and starts with full across-the-line 2,300 voltage. It drives a 60-in. Dixie hammer-mill direct through a Falk coupling. Although very severe starting conditions are encountered and a varying load in operation, this equipment is proving very satisfactory.

The other method to reduce power cost, beside power-factor control, was the direct control of "peak" demand loads. This called for close coöperation of the various departments as well as a method of limiting the "peak" demand automatically. A recording demand meter with alarm contacts was therefore installed in the substation and connected with suitable relays so as to automatically release the magnetic clutch on any one of the 500-hp. mill motors when the predetermined "peak" demand limit was reached. This device, together with all the wiring from the substation to the mills, cost approximately $500, and it pays for itself at least once annually and without any serious interruption in production. As the demand charge for the Bessemer company approximates $1.20 per kw. per month during operating periods, it can readily be seen that the removing of 1 mill, or 350 kw. of demand, at the critical time means a considerable saving. The demand meter used on this control is a General Electric unit with Westinghouse relays and circuit-breakers.

Asphalt Production in 1934

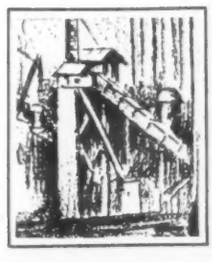
Revived activity in highway construction, stimulated by allotments of Federal funds, and a somewhat greater demand for roofing raised production both of petroleum asphalt and of native asphalt and bitumen from 1933 to 1934. Refinery production of asphalt increased 16 per cent. from 2,456,051 short tons in 1933 to 2,840,496 tons in 1934, according to figures compiled by the Bureau of Mines, Department of the Interior. Domestic demand increased 12 per cent., from 2,296,046 tons in 1933 to 2,569,395 tons in 1934. Exports of petroleum asphalt especially to northern and western Europe and to the Far East increased from 204,032 short tons in 1933 to 223,906 tons in 1934. Imports of asphalt and bitumen, however, decreased from 21,706 short tons in 1933 to 15,679 tons in 1934.

MEN OF THE INDUSTRY



A. G. CARLSON

A. G. CARLSON, chief engineer of the Universal Atlas Cement Co., Chicago, Ill., has been with that company for 32 years. He started as designer at its Buffington, Ind., plant and 20 years ago was appointed to his present position. Prior to his connection with Universal Atlas he was with the Sandusky (now Medusa) company and designed and built its plant at Syracuse, Ind. Mr. Carlson is a member of the American Society of Mechanical Engineers, Western Society of Engineers and Chicago Engineers' Club. Since 1915 he has been a member of the Portland Cement Association's Conservation Committee whose object is to secure more efficient and economical plant operation.



Personal Mention

M. E. Crosby, who has been engaged in the designing and building of cement mills and grain elevators for many years, is now associated with the Jones-Hettelsater Construction Co., 600 Mutual Bldg., Kansas City, Mo. Mr. Crosby was formerly with the Macdonald Engineering Co., and before that with the Burrell Engineering & Construction Co.

Frank B. Ungar has just been made assistant sales manager of the Ludlow-Saylor Wire Co. of St. Louis, Co. In June he completed his 35th year of service with the company.

J. N. Bauman, assistant sales manager of the White Motor company, has been made general sales manager. In his new position, Mr. Bauman will direct the sales activities of White through a world-wide sales organization of 80 direct factory branches and several hundred dealers. He succeeds **George F. Russell,** resigned.

J. N. Bauman

William Fair Hutchinson, member of the board of directors of the Monarch Cement Co., was elected sec.-tr. of the company upon the death of **F. A. Woolf** who occupied the position.

L. F. Livingston, manager of the Agriculture Extension Section of the Explosives Department of the du Pont Co., has been elected president of the American Society of Agricultural Engineers at the annual meeting of the society at the University of Georgia, Athens, Ga.

A. G. Forssell, who has been with the Morris Machine Works, of Baldwinsville, N. Y., since 1922, has been appointed chief engineer of the company.

Charles W. Daniels, who recently was in charge of the Philadelphia office of the Harnischfeger Corp. of Milwaukee, Wis., has been appointed general sales manager of the entire line of Harnischfeger products. He will be located at the home office of the corporation in Milwaukee, Wis.

C. W. Daniels

Arch Miller has been appointed packing representative for the United States Rubber Products, Inc., in the Pittsburgh district.

Norman V. Geyer, formerly chief chemist and assistant superintendent of the Pennsylvania-Dixie Cement Corp. plant at Kingsport, Tenn., has been made superintendent of that plant. He joined the Penn-Dixie staff as chemist and was later made assistant superintendent. He graduated in chemical engineering from Purdue University in 1918.

H. P. Bacon, for the last five years in charge of engineering work in the heating and drying department of Robertson & Co., Inc., has been made sales manager of the Northern Blower Co., Cleveland, according to **M. A. Elben,** the company's president and general manager.

E. M. Confer, who was general superintendent of the Alabama Lime and Stone Corp., from 1920 to 1931, and has had extensive experience in the cement field, was appointed superintendent of the Muscle Shoals White Lime Co., Sheffield, Ala.

Felix Guenther, Jr., for nine years general superintendent of the Kingsport, Tenn., plant of the Pennsylvania-Dixie Cement Corp., has just been made chief engineer of the company. Prior to joining this company he had been for ten years general superintendent of the Clinchfield Portland Cement Co. and before that had served other companies in the same capacity.

Obituary

Stephen Sparks, 16, son of H. S. Sparks, superintendent at the quarry of the Southwestern Portland Cement Co., at El Paso, Texas, was crushed to death at the quarry, June 26, by a shower of rock from a premature explosion of dynamite.

Burney L. Cox, 73, president of the Cement Products Co., of Birmingham, Ala., died at his home May 22, in Birmingham.

Franklin T. Brodix, 66, president of the Monon Stone Co., died May 27, at his country estate near Bloomington, Ind.

F. A. Woolf, 78, sec.-tr., and member of the executive committee of the Monarch Cement Co., died June 9, at his home in Wichita, Kan. Mr. Woolf was elected sec.-tr. of the company at the annual meeting held last February. He succeeded Fred H. Rhode who became president of the company on the death of H. F. G. Wulf.

Harry R. Welch, 58, general superintendent of the Marble Cliff Quarries Co., of Columbus, O., died June 21, at his home in Columbus.

John O. Bainter, 38, well-known gravel-pit operator, was crushed to death on June 3, beneath a truck at his home near Goshen, Ind.

Coming Events

July 3-5, 1935, Los Angeles, Cal.—Annual convention, American Society of Civil Engineers.

July 17, 1935, LeRoy, N. Y.—Annual meeting, New York State Crushed Stone Assn.

August 19-24, 1935, San Francisco, Cal.—Annual convention, American Chemical Society.

October 14-18, 1935, Louisville, Ky.—24th Annual Safety Congress, National Safety Council, Inc.

December 2-7, 1935, New York, N. Y.—Exposition of Chemical Industries.

December 9-12, 1935, Miami, Fla.—Annual convention, American Assn. of State Highway Officials.

Link-Belt Appoints New Kentucky Agent

Henry A. Petter Supply Co., Paducah, Ky., has been appointed by the Link Belt Co., Shovel and Crane Div., as distributors of Link-Belt crawlers, mounted shovels, cranes, draglines, and track-type locomotive cranes.

United States Rubber Products, Inc., Mechanical Goods Div., announces its New Orleans branch, formerly located at 202 Fulton St., is now located at 440 Canal St.

NEW CORPORATIONS

THE BRIGHTON SAND CO., 1310 Majestic Bldg., Detroit, Mich. Capital stock $75,000 of which $10,000 is paid in.

THE MICHIGAN STONE CO., 14100 Welland Av., Detroit, Mich. Capital $10,000 of which $3,000 is paid in. To operate quarry.

THE LIME ROCK CO., Miami, Fla. Incorporators, E. B. Mills and F. G. Murphy, Jr.

THE ARROWHEAD GRAVEL CO., Watson, Calif. Capital $5,000. Incorporators, John E. Porter, Charles E. Bloom and A. J. Wilson.

MORSE CRUSHED ROCK CO., Portland, Ore. Capital 1,000 shares of n. p. v. Officers, Clement V. Morse, president, South Portland; and Freeman Etheridge, Jr., Portland.

E. T. SLIDER, Inc., 201 East Market St., New Albany, Ind. Capital stock 4,000 shares n. p. v. Incorporators, Edward T. Slider, Chester C. Slider, Clarence N. Slider, Walter Slider, Osborne G. Reilly and Charles D. Kelso. To engage in sand, gravel and coal business.

LANNON STONE SALES ASSN., Inc., Milwaukee, Wis. Capital 500 shares of n. p. v. common stock. Incorporators, A. C. Swallow, Jr., C. A. Starkweather, A. L. Schneider. To mine stone and mineral.

THE CLEMENTE BROS. SAND & GRAVEL, Inc., Rensselaer, N. Y. Capital 50 shares par value of $100. Incorporators, Salvator Clemente, Mary Clemente and Carmine Clemente.

LENSCH SAND & GRAVEL CO., Babylon, N. Y. Capital $25,000. Consolidation of the Lensch Sand & Gravel Co., Frank J. Lensch Trucking Corp., and Lensch Concrete Products Co. Incorporators, Frank J. Lensch, Julius Lensch and Marguerite L. Lensch.

THE TOPEKA SAND CO., Topeka, Kan. Capital $10,000. Taken over the Wear Sand Co. Officers, Otis S. Allen, president; H. S. Blake, 1st vice-president; F. A. Laughead, 2nd vice-president, secretary-treasurer. Other persons interested in the firm are W. W. Payne, G. S. Allen and J. M. Rankin. To operate two sand plants on Kaw River.

KENTUCKY STONE CO., Louisville, Ky. Capital $7,500. Incorporators, Thomas B. Bullitt, Wiley B. Bryan and John N. Mackall.

Foreign Developments

Properties of Cement for Road Construction

The use of cement as a road-building material has received a great impetus during the Hitler *régime* in Germany, not only because of the great network of state roads that are being executed but also because of the greater preference now given to concrete highways. Dr. G. Haegermann consequently reviews, in an address before the Association of German Portland Cement Manufacturers, published in *Zement* for April 18, 1935 (24:243-248), the characteristics of cement, in relation to its preparation, necessary for maximum utility in road construction.

The raw material, he says, must be sufficiently finely ground and intimately mixed. The clinker must be sharp burned, and must contain only slight amounts of uncombined lime. As to chemical composition, the proportion of the bicalcium silicate and tricalcium aluminate should not be too high; the same is true for magnesia. The clinker should not be too finely ground. The fineness of the cements customarily on the German market is sufficient for the production of strength in road work. Materials that increase shrinkage should not be admixed with the cement.

Dr. Haegermann argues that the standard tests now written for cement are not adequate for judging a cement for highway construction; it would be preferable to provide a strength test method that is based on plastic mortar, and additional tests should be provided for shrinkage, elasticity and inclination to the formation of cracks.

"Brownmillerite" Cement Developed for Sea Work

Recent publications by Dr. Ferrari on the subject of special high-strength cements recall an experience of the Chee Hsin Cement Co., Tangshan, China, with a special cement for construction in sea water. It was decided to reduce the alumina reactions in the cement by the addition of materials high in iron oxide, which hindered the formation of tricalcium aluminate and brought about the formation of tetracalcium aluminate ferrite (Brownmillerite). At the same time experiments were made to produce from the available raw materials a serviceable puzzuolan to combine the free lime liberated in the hydration of the cement. This was done by thermal treatment of a shale found in the vicinity of the plant. Strength tests made with this shale, heated to various temperatures and either cooled in air or quenched in water, showed most favorable results when the material was heated to around 600 deg. C. and cooled in air.

Comparative tests on specimens immersed in distilled water and concentrated sea water, respectively, were then made with normal cement, "Brownmillerite cement" and the Brownmillerite cement with the shale puzzuolan admixture. The specimens immersed in sea water were also prepared with sea water as mixing water, and would probably have shown even better strengths if soft water had been used for mixing. The tensile strengths, by Kühl's "miniature" testing process, to 90 days, are shown in the table.

	"Miniature" Tensile Strength (*kg. per sq.cm.*)					
	7	14	21	28	60	90
Binder Storage	Days	Days	Days	Days	Days	Days
Portland cement:						
Distilled water	20,6	—	—	21,8	22,8	24,1
Concentrated sea water.	9,9	10,6	8,0	6,3	7,4	6,6
Brownmillerite cement:						
Distilled water	22,5	—	—	23,1	24,3	24,3
Concentrated sea water.	12,6	12,0	13,6	13,4	17,8	18,7
90% Brownmillerite cement + 10% shale:						
Distilled water	24,6	—	—	27,0	28,3	30,1
Concentrated sea water.	16,8	—	—	19,8	20,3	20,5

Aside from the increased resistance to sea water because of the absence of tricalcium aluminate, it is to be expected that this cement would be distinguished by favorable properties as to shrinkage and as to heat development in setting and hardening.—Wang Tao, Chee Hsin Cement Co. (Tangshan, China), in *Tonindustrie-Zeitung* 59:178-179, Feb. 14, 1935.

Kiln in Spain Produces Cement and Molten Iron

The first application of the Basset process for the simultaneous production of molten iron and cement clinker, outside the factory of the inventor, has been made at the Moncada plant of the Asland company in Spain. The process is employed in one of the three kilns of the plant, modified in some respects as required for the changed operation, and after a period experimentation and observation it is now felt that the operation has reached a point of complete normality.

The raw materials employed are iron ore, coal and limestone, and the components of all three minerals are completely utilized in recombining into iron and cement clinker, leaving no waste or "by-product." The kiln operates by the dry process. At the entrance to the kiln the mixture becomes slightly moist. At about 3 m. from the head of the kiln is a hole through which the molten iron is discharged at every revolution of the kiln, while the cement clinker pours continuously from the upper end of the kiln, as in the usual rotary cement kiln. One of the most striking features of the process is the way in which the two materials completely separate before being discharged.

The iron and the cement produced are of high quality. The iron contains around 4 per cent. carbon and traces of phosphorus. It is low in silicon and manganese. Iron with 3 per cent. of magnesium, maintaining the carbon at 4 per cent., has also been produced, making a good material for the manufacture of steel in the Siemens Martin kiln. As for the cement, it possesses all the normal characteristics for this product.—Patricio Palomar Collado in *Cemento* (Barcelona) 7:121-127, March, 1935.

Observations on Freeing of Heat in Set of Cement

A summary of an investigation of the physical phenomena accompanying the setting of various cements, conducted by P. Erculisse and A. O. Purdon, is published in *Revue des Materiaux de Construction* for May, 1935 (No. 308, p. 129). The investigation of changes of volume was conducted according to Le Chatelier's method, and gave the same results: fused (alumina) cement gave a much greater change of volume than the portland cements, while the volume change of the metallurgical cements was practically nil.

For observing the quantity of heat liberated the investigators used a different calorimeter from that employed by M. Marcotte in his earlier studies of the same phenomenon, and although their observations tend in the main to confirm his they differ considerably in certain details. The cures on which the liberation of heat was charted have a direct relation to the speed of the reaction between cement and water, the latter depending on several factors: chemical nature of the system, temperature, and fineness of grinding. The influence of alumina is very clear. Its reaction is very lively, the set rapid and the heating considerable. The heating of Portland cements approaches that of alumina cements as the quantity of alumina contained in them increases. The "metallurgical" and the "iron" cements have a quite different rate of set and are remarkable for the slowness of the liberation of heat during the reaction. A special cement, patented by M. Purdon and composed of slag mixed with a solution of soda or of sodium carbonate and lime, is remarkable for the high strengths its gives at the end of a very short time. The development of

(*Continued on Page 52*)

Traffic News and Comment

Legislation

The long-expected transportation program of the administration has been held up from time to time on account of what was considered by the administration more important matter. At various press conferences during the month of May the president stated that he expected to have a message for Congress on transportation soon. The decisions of the Supreme Court in the Schechter case and in the Railroad Labor Retirement Act case have further postponed the announcement of a definite program of transportation legislation.

Title I of the emergency railroad transportation act, 1933, would have expired by limitation at midnight, June 16, had not the Congress passed a resolution extending the provisions of the act for another year. This title provided for the office of a federal coördinator of transportation, an office held by Commissioner Eastman. The thought behind the creation of this office was that through the office plans might be made that would result in reducing the cost of railroad transportation. The act provided, however, that in making any changes in the operation of the railroads no reduction was to be made in employment.

During the two years in which the coordinator has been working under the act creating the office his hands have been tied by the labor provisions of the act and very little has been accomplished. Shippers and railroads have had ample opportunity to submit facts, figures and opinions to the coördinator through the medium of answers to numerous questionnaires submitted by him. The cost of the administration of the act is borne by the railroads, who paid about $400,000 the first year and more than $500,000 the second year. There is now the question of whether the act is constitutional in view of recent court decisions and it is possible that the carriers may soon decide to ignore the labor provisions of the act, thereby bringing this legislation before the court.

Representative Pettengill has introduced a bill in the House repealing the fourth section of the Interstate Commerce Act. This section makes it unlawful to charge more for transportation for a short haul than for a long haul, the short haul being in the same direction and included within the long-haul route, and the kind of property being the same, except that the Commission is authorized to grant relief from the operation of this section to meet water competition or for other stated reasons.

At the hearing before the subcommittee of the House committee on interstate and foreign commerce on June 17, Johnston B. Campbell, a former member of the Commission, appeared for the Intermediate Rate Assn. against the bill. This bill is endorsed by the National Industrial Traffic League, whose witness states that the public interest is best served when traffic is allowed to move freely over all transportation agencies. The one provision in the section that protects water carriers to some extent is that in meeting water competition the rate must be reasonably compensatory. Frank Lyon appeared for the steamship companies operating in intercoastal service through the Panama Canal, having an investment of approximately $100,000,000, opposing this legislation. He pointed out that the Commission in its reports to Congress has never proposed the repeal of this section.

Recent I. C. C. Decisions

Advanced Freight Rates.—The petition of certain producers of crushed stone, sand, gravel and slag, in the court of the northern district of Alabama asking for an injunction forbidding the railroads from adding the surcharges to the rates on the products mentioned has been heard by a three-judge court. (See PIT AND QUARRY, June, 1935, p. 48.) The court in denying the injunction pointed out that the rates were not prescribed by the Commission as reasonable rates; that the Commission had not passed on the reasonableness of the rates, but that the rates were merely carrier-made rates and as such were subject to review by the Commission. The court further pointed out that the proper procedure was by a petition to the Commission for a hearing on the reasonableness of the rates, and that if complainants felt that they had been damaged by reason of the increased rates they might petition the Commission for reparation.

The Commission has denied the petition of the National Crushed Stone Assn. and others for reconsideration and cancellation of the emergency charges on crushed stone, sand, gravel, slag and related commodities.

The Tennessee Commission in granting certain increases has exempted agricultural limestone. The Alabama Commission refused to allow the emergency charges on the common aggregates, agricultural limestone and on lime. The Arkansas Commission has included the common aggregates in the list of items not subject to the increased charges. Florida has exempted agricultural limestone; Kentucky, crushed stone, sand, gravel and other aggregates; and Louisiana has listed agricultural limestone as an exempted item. In West Virginia the increases were not allowed on ground or agricultural limestone, and in South Dakota permission to increase the rates on aggregates was withheld. Ex Parte 115.

Sand.—The Commission has awarded reparation on finding that the rate on sand from Hawarden, Ia., to Canistota, S. D., was unreasonable to the extent it exceeded 60 c. per ton on shipments made between Aug. 26, and Oct. 2, 1932. I. C. C. Docket No. 26,656, C. A. Wagner Construction Co. *v.* C. & N. W.

Examiners' Reports

Cement.—Examiner Horace W. Johnson has recommended that the Commission award $1,033.60 reparation on a finding that the rate on Portland cement from Hannibal (Ilasca Jct.), Mo., to Evansville, Ind., for river movement beyond was unreasonable to the extent it exceeded 11 c. not subject to the emergency charge on 18 car-loads shipped on Aug. 15, 1933, in I. C. C. Docket No. 26,826, Universal Atlas Cement Co. *v.* Wabash *et al.*

Sand.—Examiner Henry B. Armes proposes that the Commission award reparation on finding that certain rates on core sand to New Brunswick, N. J., be found unreasonable to the extent that they exceeded from Davisville and E. Greenwich, R. I., $2.95 and from Hills Grove, $3.15 and on molding sand from Elnora, N. Y., to the extent it exceeded $1.80 per net ton, car-load minimum weight 90 per cent. of the marked capacity of the car, in I. C. C. Docket No. 26,779, International Motor Co. *v.* D. & H. *et al.*

New Complaints Filed

Lime.—J. T. Preston, practitioner, of Roanoke, Va., has filed a complaint attacking the reasonableness of the rate on fluxing lime from Gibsonburg, O., to Laurens, S. C., and praying for reparation in I. C. C. Docket No. 27,008, Laurens Glass Works, Inc., Laurens, S. C. *v.* C. & W. C. *et al.*

Rates on fluxing lime from Gibsonburg, O., to Chattanooga, Tenn., in violation of Sec. 1 are alleged and reparation asked for in a complaint filed in I. C. C. Docket No. 27,012, Chattanooga Glass Co., Chattanooga, Tenn. *v.* Pennsylvania *et al.*.

Limestone.—Reparation is sought on an allegation of unreasonable rates on limestone from Thomasville, Pa., to Bridgeton, N. J., in a complaint filed in I. C. C. Docket No. 26,990, Owens-Illinois Glass Co., Toledo, O. *v.* C. R. R. of N. J. *et al.*

Sand.—New rates and reparation are sought and a violation of Sec. 1 alleged on molding sand from Ushers and Round Lake, N. Y., to Bristol, Conn., in a complaint filed in I. C. C. Docket No. 26,978, Sessions Foundry Co., Bristol, Conn. *v.* N. Y. N. H. & H. *et al.*

Violation of Secs. 1 and 4 is alleged and reparation asked for in connection with the rates on sand from Wedron, Ill., to New York, N. Y., and Hillside, N. J., in a complaint filed in I. C. C. Docket No. 26,986, Amersil Co., Inc., Hillside, N. J. *v.* C. B. & Q. *et al.*

Reparation is sought and violation of Sec. 1 alleged on sand from Ottawa and Wedron, Ill., to Salem and Newark, O., in a complaint filed in I. C. C. Docket No. 26,999, Mullins Mfg. Corp. *et al.*, Salem, O. *v.* B. & O. *et al.*

A Sec. 1 complaint asking reparation on molding and foundry sand from points in New York and New Jersey to Bristol, Conn., in I. C. C. Docket No. 26,978, Sub. No. 1, Sessions Foundry Co., Bristol, Conn. *v.* N. Y. N. H. & H.

A Sec. 1 complaint seeking reparation on molding and foundry sand from points in New York and New Jersey to Whitins, Mass., in I. C. C. Docket No. 27,010, Whitins Machine Works, Whitins, Mass. *v.* N. Y. N. H. & H. *et al.*

A similar complaint involving like shipments with same complainant and same defendants filed as Sub. No. 1 to Docket No. 27,010.

A complaint attacking the rates on processed silica sand and crude sand from Ottawa, Ill., to Barberton, O., as violating Sec. 1, and a prayer for reparation has been filed in I. C. C. Docket No. 27,031, Babcock & Wilcox Co., New York, N. Y. *v.* B. & O. *et al.*

New rates and reparation are sought on an allegation of violation of Sec. 1 on the shipment of industrial sand from Wrights, N. J., Schenectady, Aqueduct and Ushers, N. Y., to Atkins, N. Y., via interstate routes, in a complaint filed in I. C. C. Docket No. 27,032, Columbia Machine Works and Malleable Iron Co. *v.* D. & H.

Foreign *(from page 51)*

heat liberated is, however, extremely slow.

The results do not confirm the relation which Marcotte believed he had been able to establish between the quantity of heat liberated in set and the future strengths developed by the cement; conclusions of this kind can not be so formal.

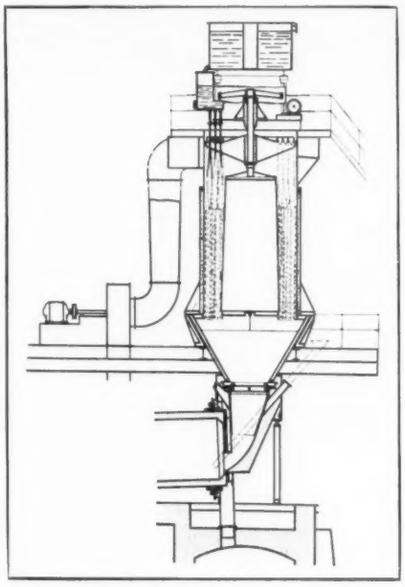
Instrument Makers Open Joint Office in Atlanta

The Brown Instrument Co., Philadelphia, Pa., manufacturers of instruments and controls, and the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., manufacturers of control systems and regulators, have opened a joint office at 303—the 101 Marietta Street Bldg., Atlanta, Ga., to serve the southeast. Westley R. Moore, district manager of Brown Instrument Co., is manager in charge, with Leon L. Kuempel, sales engineer; Charles A. Kitzinger, service engineer; and J. A. Crawley, office manager.

New Machinery and Supplies

Waste Heat Slurry Drier of Vertical Chain Type

The Polysius Corp., Bethlehem, Pa., announces the new Polysius slurry drier designed to utilize the waste heat from wet-process kilns. This drier consists of two concentric vertical cylinders which form an annular space. Both cylinders are stationary and the outside one is insulated to reduce radiation losses. A conical outlet to the feed end of the kiln is joined to the outer cylinder and the inner cylinder is closed at its lower end, serving only as a guide to force the hot kiln gases through



Vertical waste-heat slurry drier.

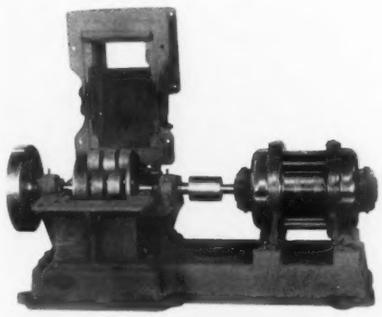
the annular space to the top. Chains suspended in the annular space serve as heat exchange bodies and the slurry feed is through jets at the top. The gases from the kiln first encounter the dried slurry and as they leave the chain system the liquid slurry removes much of the dust. A suction fan collects the exit gases and steam.

The chains are suspended from a system of rotating brackets which are electrically controlled so that the direction of rotation is automatically changed at intervals. The swinging motion of the chains resulting is said to prevent clogging of the chains by the slurry. The chains can also be given a vertical motion. A gas-tight head connects the lower end of the drier to the kiln and a horizontal damper allows short-circuiting the drier, the gases passing direct to the dust chamber and stack. A number of large doors give easy access to the interior of the drier. The makers claim that this drier will increase the output of a kiln at least 25 per cent. and decrease the fuel consumption a like amount.

Laboratory Crushers With Features of Larger Units

The American Pulverizer Co., St. Louis, Mo., has developed a series of laboratory crushers and pulverizers which can be used for grinding a large variety of materials. These small crushers have all the features of the larger units made by this company and are sold on a guaranteed performance basis. Included are hammer-mills and two sizes of the well-known American ring mill, 9-in. by 9-in. and 15-in. by 9-in.

All parts of the housing are machined



Ring-roll laboratory pulverizer.

to fit and insure interchangeability of parts. Housings are reinforced with ribs and the bearing pedestals are cast integral with the one-piece lower housing. The rotor or cylinder consists of a heavy main shaft of alloy steel, cast steel end discs and manganese steel rings or hammers. The main shaft rotates on SKF ball bearings which are mounted in dust-tight self-aligning pillow blocks. As in the larger crushers practically all the grinding is done on the breaker and grinding plates in the front of the grinding chamber.

Grate Clinker Cooler Uses Air Quenching Principle

The Unax grate cooler developed by F. L. Smidth & Co. is based on the air quenching principle and consists of two parts, one stationary and one revolving. The stationary part comprises an insulated casing surrounding the outlet end of the kiln, and in the bottom of this casing is a stationary grate of rigid design. The revolving part of the cooler is attached to the end of the kiln shell and consists mainly of conveying flights and scoops which rotate with the kiln. The hot clinker is discharged from the kiln through a screening ring and falls upon a layer of cool clinker resting upon and protecting the grate. As the kiln rotates, the flights and scoops convey the hot clinker toward the outlet end of the grate, spreading the layer at an even thickness over the entire area of the grate. Atmospheric air for cooling the clinker is supplied by means of a fan to various compartments beneath the grate. The air passes through the grate and the layer of clinker, the air thus being preheated to a high degree whereas the clinker is rapidly cooled. As the grate is stationary and always protected by a bed of cool clinker, and the other parts of the cooler revolve at a slow speed, the wear and tear is said to be very small.

The preheated air is used for combustion of the fuel in the kiln, the amount entering the kiln being regulated in the usual way by adjusting the kiln damper. If it is desired to cool the clinker to a very low temperature, a small amount of air in excess of that required for the combustion is introduced and in that case this excess air will leave the cooler through a relief stack located in the upper end of the cooler mantle. The air discharged at this point is comparatively cool and the corresponding heat loss is therefore negligible.

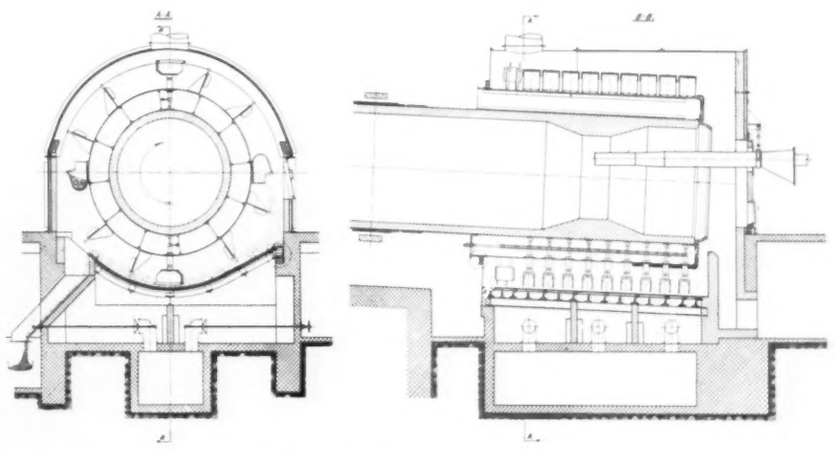
The advantages of the Unax grate cooler as summarized by the manufacturer are as follows:

Rapid and efficient cooling of the clinker; increased fuel economy of the kiln due to the high degree of preheating of the air for combustion through the intimate contact between the clinker and the cooling air; increased grindability, and improved quality of the cement, through the rapid cooling of the clinker; lower first cost of the kiln installation due to the small head room required for the cooler, reducing the height of the kiln piers and the kiln building; no separate motor required for driving the cooler; low maintenance cost due to simplicity in design and slow speed of moving parts.

Among the installations of this cooler it is interesting to note that the longest kiln at present operating in the world is equipped with this Smidth Unax grate cooler. The kiln is 512 ft long, having a capacity of approximately 4,000 barrels per day, and is in operation at the plant of the Tunnel Portland Cement Company, near London, England. Also that a new installation at another plant is now being made in connection with a kiln still larger than the above, namely, 520 ft. long.

Combination Dump Wagon, Scraper and Distributor

The Continental Roll & Steel Foundry Co., Chicago, Ill., announces the new Continental wagon scraper, a complete dirt-moving unit of 5 cu. yd. capacity. This machine is a combination scoop-up and carry scraper; a hauling dump wagon and a distributing unit, all operations being performed with only one handling of the material. This machine will dump backward like a truck in addition to windrowing and stock-piling. It will scoop its own load but can be used with a shovel or



Air quenching grate-type clinker cooler.

Heavy-duty wagon scraper.

dragline and it can be either pulled or backed into position.

These units are designed for heavy digging work and are built of alloy steels throughout. The frame is a one-piece "Dynamic Steel" casting. The bucket, dirt-carrying extension apron and rear door are alloy plate. Electric welding is used throughout. The wagon scraper is carried on two low-pressure pneumatic-tired wheels which are mounted on roller bearings. All operations of the scraper—scooping, hauling and dumping—are controlled hydraulically by one lever.

Develop Kiln Block With Higher Heat Resistance

Johns-Manville Superex Blocks, used for many years by the cement industry for insulating rotary kilns, were recently improved to provide even greater heat resistance than the former material. Through the use of a special calcined diatomaceous earth base, the temperature limit has been raised from 1600 deg. to

Kiln being lined with high-temperature resisting blocks.

1900 deg. F. The insulating efficiency of the block at high temperatures is also said to have been increased.

Under the severe service to which insulation is subjected in rotary kilns, the method of installing the insulation and refractory lining is a matter of great importance. In addition to the high temperature involved, the lining must withstand rotation, vibration, abrasion, expansion and contraction and the continued impact of the heavy mass of clinkers. A method which is said to have met with unvarying success consists of 2½ in. of Superex blocks (2 in. at rivets) laid next to the shell in a bedding of insulating cement and followed by 6 in. kiln blocks. The refractory lining is bonded to the shell with 9 in. kiln blocks on each quadrant longitudinally and at approximate 20-ft. intervals circumferentially.

The increased temperature resistance of the new Superex blocks, it is claimed, makes it possible to carry insulation farther into the hot zone of the kiln than has been possible in the past.

Portable Bucket Loader With Many New Features

The Portable Machinery Co., division of A. B. Farquhar Co., Ltd., York, Pa., manufactures a complete line of Porta conveyors for handling loose materials. This line includes flat and trough belt conveyors, drag conveyors, sectional conveyors of the shuttle type or with tripper, self-feeding bucket loaders, and a complete line of port-

Wheel-mounted bucket loader.

able loading and unloading conveyors, all in a variety of models, sizes and mountings. The bucket loader, for example, can be obtained with wheel or crawler mounting. It has a manganese-tipped spiral feed, swiveling spout, and many other features. It has a capacity of from 90 to 120 tons per hour.

New 2½ Cu. Yd. Electric Shovel Has Three Motors

The Marion Steam Shovel Co., Marion, O., has developed the Type 4101—2½-cu. yd. electrical shovel with three motor drive Ward-Leonard control. This machine is the smallest in the intermediate group of close-coupled quarry-type shovels made by this company and has the same features of construction as the larger sizes. These features include single-reduction herringbone gears for hoisting; live roller circle with evenly-distributed rotating load; three-motor drive; Ward-Leonard control; enclosed non-clogging crawlers; manganese steel crawler shoes and sprockets; long boom section above shipper shaft for correct digging angle; triple hitch to dipper for hoisting cable. The shovel can

A 2½-cu.yd. electric convertible shovel.

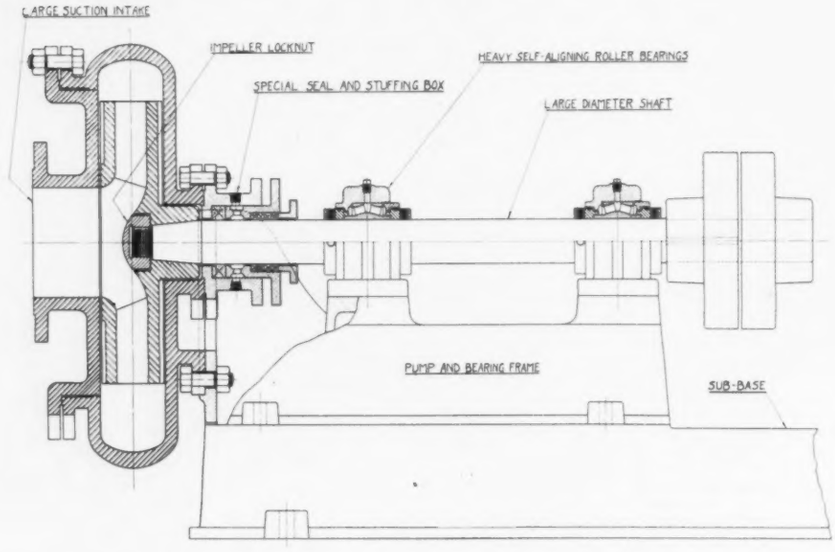
be equipped with any of three combinations of front end equipment—31-ft. boom and 2½-cu. yd. dipper; 34-ft. boom and 2¼-cu. yd. dipper; 36-ft. boom and 2-cu. yd. dipper. It is also convertible into a crane or dragline.

A four-unit self-contained motor-generator set, consisting of an induction motor direct-connected to three generators is standard equipment on the shovel. Mill type, shunt-wound motors are used for hoisting, rotating and crowding.

New Centrifugal Pump Is Designed to Handle Slurry

The Lawrence Machine & Pump Corp., 371 Market St., Lawrence, Mass., announces the "Lawrence" slurry pump which has been designed specially to handle this material. The manufacturers state that only three parts of the pump come in contact with the slurry and are subject to wear, these being the shell, the impeller and the suction disc. These parts are of simple design, extra heavy, and are made of wear-resisting alloy iron, with a Brinell hardness of from 600-700. The shell is made extra thick with flanges for bolting to the disc and slots are used in the flanges instead of bolt holes. The impeller is locked securely on the shaft with a taper fit and a nut which fits into a recess in the hub. The impeller is of the enclosed type with large clearances and passageways. The shaft is of alloy steel, extra large diameter, and is secured in the self-align-

The pump and the bearings are mounted



Cross-section of pump designed especially for slurry handling.

on a separate frame or base and the whole unit can be lifted out for overhauling and replaced readily with another unit without disturbing the sub base, the motor or the piping. All parts of the pump are renewable and interchangeable. The suction intake is made larger than the discharge and is carried all the way back into the eye of the impeller. A double stuffing box with a water seal chamber in between is used, the pressure on each set of packing being regulated independently by allowing a small quantity of water to flow through the sealing chamber. This method is said to keep any moisture from being added to the slurry and at the same time seals the stuffing box against leakage of the slurry or the entrance of air and keeps the shaft and packing cool.

Many Improvements Made to Grate-Type Clinker Cooler

The Cement Mill Equipment Co., Detroit, Mich., has improved the burner and mixing chamber which is a part of the Lee Process clinker cooler. The operator can now adjust the flame to any position desired and has complete control over the length of the flame. A mechanical device can increase or decrease the turbulence as desired. The mixing chamber and the pipe carrying the secondary air are lined with refractory. The burner pipe is of steel and is surrounded with a jacket of heat-resisting alloy. The air space between the jacket and the burner pipe prevents pre-ignition as the secondary air for combustion ranges between 1200 and 1300 deg. F.

The method used in sealing the damper structure has also been improved. This consists of a floating gate which divides the receiving chamber from the processing and final cooling chambers of the cooler. This gate and its manifold—or shaft—is constructed of heat-resisting alloy and is air cooled. It is mounted on ball bearings and is so constructed that it will take care of any large lump, parts of rings, any material that will pass through the clinker chute, and will allow it to pass through the cooler without damage to the machine. At the discharge end of the processing chamber a similar gate is employed.

Flat Belt Cutter Said to Use Entirely New Principle

An 8-in. flat belt cutting tool, which employs a new principle in mechanical belt cutting, is announced by the Flexible Steel Lacing Co., 4607-31 Lexington St., Chicago, Ill. The cut is made by pushing the knife through the belt from one edge to the other. The knife is mounted on a plunger in a slot and is operated easily by a direct arm push without mechanical leverage.

The knife, it is claimed, will cut even the thickest and toughest belts up to 8 in. in width with surprisingly little effort. The knife, of special alloy steel, will make several thousand cuts and is easily replaceable.

The belt is held immovable by the equalizing clamp or hold down while the cut is being made. The clamp is also a guard for the blade. Clamp and frame are strongly built of aluminum alloy, the weight of the cutter being only 4 lbs. and 3 ozs. The cutter is used either on the bench or up-ended on the floor.

New type of belt-cutting tool.

MANUFACTURERS' PUBLICATIONS

Portable Conveyors. (Portable Machinery Co., Div. of A. B. Farquhar Co., Ltd., York, Pa.) A pamphlet illustrating the uses of the portable conveyors, manufactured by this company, for handling loose materials.

Processing Machinery. (The Patterson Foundry & Machine Co., East Liverpool, O.) A pamphlet illustrating mixers manufactured for the processing industries.

Lubrication. 25 p. (Alemite Corp., Chicago, Ill.) The Alemite Powergun Equipment Catalog describes and illustrates all equipment and accessories necessary for a complete lubrication job. Full details and specifications are given.

Belt Preservatives. (E. F. Houghton & Co., Philadelphia, Pa.) A folder entitled "Houghton on Belt Preservatives" gives information on how, when and why to use a belt preservative.

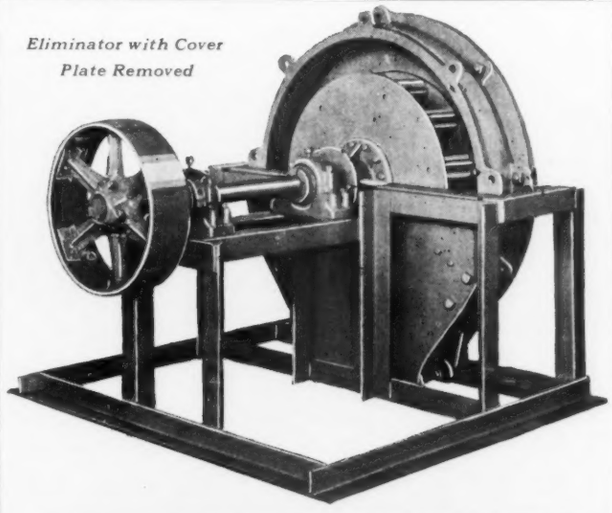
Crushers, Grinders and Shredders for the Laboratory. 5 p. (American Pulverizer Co., St. Louis, Mo.) A pamphlet describing the small crushers, grinders and shredders using the rolling ring principle introduced and manufactured by this company.

Gasoline Locomotives. (Vulcan Iron Works, Wilkes-Barre, Pa.) A pamphlet illustrating different types of gasoline locomotives manufactured by this company.

Truck Bodies and Hydraulic Hoists. 7 p. (Anthony Co., Inc., Streator, Ill.) A folder fully illustrating and describing hydraulic hoists for truck bodies, truck bodies and other appliances manufactured by this company.

Screens, Grizzlies, and Seal Rings. 30 p. (Huron Industries Co., Alpena, Mich.) A loose leaf pamphlet divided into three sections, one for seal rings for rotary kilns, driers and coolers, another for Heaviduty screens, and the other section for grizzlies.

Eliminator with Cover Plate Removed



KNICKERBOCKER Soft Stone Eliminator

Reduces friable material to a percentage that will pass specifications. Thus it creates a market for gravel formerly unsalable—brings new jobs within your bidding range. Built to take extreme punishment. Write for details.

THE KNICKERBOCKER COMPANY

603 Liberty Street — Jackson, Michigan

WEAR RESISTER

* **Protects vital parts from wear**
* **Prolongs pump life**
* **Reduces repair costs**
* **Eliminates costly shutdowns**
* **Increases production**

The Wear Resister is the most far-reaching development in dredge pump history—it stops destructive abrasion and gives to Diamond Dredge Pumps a new record of service. It also may be applied to your present pump—let P.M. Co. engineers show you how. Write for Bulletin of the "Wear Resister."

PRODUCTS OF P.M. CO.

Pump Parts: Shells, Impellers, Side Levers

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Pumps Complete (Wear Resister) — Dipper Teeth — Dippers Complete—Crusher Parts—Screen Plates.

PETTIBONE MULLIKEN CO.

4712 Division St., Chicago, Ill.

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified, if brought to the attention of the Advertisers' Service Department.

Index to Advertisers on Page 72

Aftercoolers (Air)
Worthington Pump & Machy. Corp.

Aggregate-Bituminizing Plants
Hetherington & Berner, Inc.

Agitating Ladders (Dredge)
*Eagle Iron Works
Pettibone Mulliken Co.

Agitators, Thickeners and Slurry Mixers
*Hardinge Co.
*Smidth & Co., F. L.

Air Compressors (Portable)
Chicago Pneumatic Tool Co.
Fuller Co.
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

Air Compressors (Stationary)
Chicago Pneumatic Tool Co.
Fuller Co.
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

Air Filters
Dracco Corp.

Air Pumps
Fuller Co.
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

Air Separators
Gay, Rubert M.
*Hardinge Co.
Raymond Bros. Impact Pulv. Co.
Universal Road Machy. Co.

Alloys (Steel)
Ryerson & Son, Joseph T.

Ash and Refuse-Handling Equipment
*Allen-Sherman-Hoff Co.
American Manganese Steel Co.
Haiss Mfg. Co., Geo.
Hetherington & Berner, Inc.
*Link-Belt Co.
*Robins Conveying Belt Co.

Automatic Feeders
American Manganese Steel Co.
Fuller Co.
*Hardinge Co.
*Link-Belt Co.

Automatic Weighers
Fuller Co.

Babbitt Metal
Ryerson & Son, Joseph T.

Backfillers
*Harnischfeger Corp.
*Lima Locomotive Works, Inc.

Balls (Grinding)
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Balls (Tube-Mill, etc.)
*Allis-Chalmers Mfg. Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Smidth & Co., F. L.

Bearings (Anti-Friction)
Hetherington & Berner, Inc.
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.

Belt Fasteners
Flexible Steel Lacing Co.

Belting
Goodyear Tire & Rubber Co.
Haiss Mfg. Co., Geo.
*Link-Belt Co.
Republic Rubber Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.
United States Rubber Co.
*Wickwire Spencer Steel Co.
Worthington Pump & Machy. Corp.

Belt Lacings
Flexible Steel Lacing Co.

Belting (Multiple V)
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Belts (Fan)
Goodyear Tire & Rubber Co.
Republic Rubber Co.
United States Rubber Co.

Bin-Dicator
Ripley Mfg. Co.

Bin Gates
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Fuller Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.

Bins (Cast Iron)
*Allen-Sherman-Hoff Co.

Bins (Steel)
*Hendrick Mfg. Co.
Hetherington & Berner, Inc.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equip. Mfg. Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.

Blast-Hole Drills (See Drills—Blast-Hole)

Blasting Supplies
*Ensign-Bickford Co.

Blocks (Sheave)
American Manganese Steel Co.
Haiss Mfg. Co., Geo.
*Sauerman Bros., Inc.
Sprout, Waldron & Co.

Bodies (Motor Truck, Concrete Mixing)
Jaeger Machine Co.

Boots (Rubber)
Goodyear Tire & Rubber Co.
United States Rubber Co.

Borings, Core
Mott Core Drilling Co.
Pennsylvania Drilling Co.

Bronze Work (Ornamental)
Smith Wire & Iron Works, F. P.

Bucket Elevators (See Conveyors and Elevators)

Buckets (Clamshell, Orange-Peel, Etc.)
Haiss Mfg. Co., Geo.
*Harnischfeger Corp.
*Link-Belt Co.
Pettibone Mulliken Co.

Buckets (Dump)
Dempster Brothers, Inc.

Buckets (Dragline—Cableway)
American Manganese Steel Co.
*Link-Belt Co.
*Pioneer Gravel Equip. Mfg. Co.
*Sauerman Bros., Inc.

Buckets (Elevator and Conveyor)
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Pettibone Mulliken Co.
*Pioneer Gravel Equip. Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.

Buggies (Dump)
Le Tourneau, Inc., R. G.

Bulk-Cement Storage Plants
Sprout, Waldron & Co.

Bulldozers
Le Tourneau, Inc., R. G.

Cableways
*American Steel & Wire Co.
*Link-Belt Co.
*Roebling's Sons Co., John A.
*Sauerman Bros., Inc.
*Wickwire Spencer Steel Co.

Capstans (See Winches and Capstans)

Car Dumpers
*Link-Belt Co.

Car Pullers
*Link-Belt Co.

Carriers
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.

Carryalls
Le Tourneau, Inc., R. G.

Car Wheels — (See Wheels — Car)

Castings
American Manganese Steel Co.
*Eagle Iron Works
*Hardinge Co.
Hetherington & Berner, Inc.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
Pettibone Mulliken Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.

Cement Pumps (See Pumps; Air Pumps; Pumps, Cement Slurry; Pumps, Bulk Cement)

Central Concrete-Mixing Plants (Complete)
Sprout, Waldron & Co.

Chain (Dredge and Shovel)
Ryerson & Son, Joseph T.

Chain Drives
*Link-Belt Co.

Chain (Elevating and Conveying)
American Manganese Steel Co.
Haiss Mfg. Co., Geo.
*Link-Belt Co.
Sprout, Waldron & Co.

Chutes and Chute Liners
American Manganese Steel Co.
Goodyear Tire & Rubber Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
*Robins Conveying Belt Co.
*Smidth & Co., F. L.
Sprout, Waldron & Co.

Classifiers
*Deister Machine Co.
*Hardinge Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Foundry & Machine Co.
*Link-Belt Co.

Clips (Wire Rope)
*American Steel & Wire Co.
*Roebling's Sons Co., John A.
*Wickwire Spencer Steel Co.

Clutches
*Link-Belt Co.
Sprout, Waldron & Co.

Coal-Pulverizing Equipment
*Allis-Chalmers Mfg. Co.
Bonnot Co.
*Gay, Rubert M.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Raymond Bros. Impact Pulv. Co.
*Smidth & Co., F. L.
Universal Road Machy. Co.

Compressors (See Air Compressors)

Concentrators (Slurry)
*Deister Concentrator Co.

Concrete Breakers
Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

Concrete Mixers
Jaeger Machine Co.

Condensors
Chicago Pneumatic Tool Co.

Cones (Sand-Washing)
Iowa Mfg. Co.
*Link-Belt Co.
Smith Engr. Works

Conveyor Belting (See Belting)

Conveyor Idlers and Rolls
Haiss Mfg. Co., Geo.
Iowa Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.

Conveyors and Elevators
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Dracco Corp.
Fuller Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
New Holland Machine Co.
*Pioneer Gravel Equip. Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.
Universal Road Machy. Co.

Conveyors (Pneumatic)
Dracco Corp.

Conveyors (Ready-Mixed Concrete)
Haiss Mfg. Co., Geo.
Jaeger Machine Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Coolers (See Kilns and Coolers —Rotary)

Coolers (Clinker)
*Smidth & Co., F. L.

Correcting Basins
*Smidth & Co., F. L.

Couplings (Flexible and Shaft)
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.

Couplings (Hose)
Chicago Pneumatic Tool Co.

Cranes (Crawler and Locomotive)
*Harnischfeger Corp.
*Lima Locomotive Works, Inc.
*Link-Belt Co.

Cranes (Overhead)
*Harnischfeger Corp.

Crusher Parts
American Manganese Steel Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
Pettibone Mulliken Co.

Crushers (Cone)
Nordberg Mfg. Co.

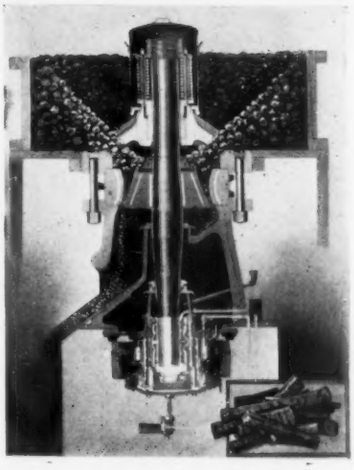
Crushers (Hammer)
*Allis-Chalmers Mfg. Co.
Bonnot Co.
*Dixie Machy Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Crushers (Jaw and Gyratory)
*Allis-Chalmers Mfg. Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
New Holland Machine Co.
Nordberg Mfg. Co.
*Pioneer Gravel Equip. Mfg. Co.
Smith Engr. Works
Universal Road Machy. Co.

Crushers (Roll)
*Allis-Chalmers Mfg. Co.
Bonnot Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
*Pioneer Gravel Equip. Mfg. Co.
*Robins Conveying Belt Co.

Crushers (Rotary)
*Allis-Chalmers Mfg. Co.
Bonnot Co.
New Holland Machine Co.

*** See also information in the 1935 Pit and Quarry HANDBOOK.**



GREATER TONNAGE with HALF THE POWER COST *Guaranteed!*

THE Kennedy Ball Bearing Gearless Gyratory Crusher is guaranteed to produce a greater tonnage than any other crusher of a given size, with half the power per ton of ore. This crusher can be equipped with a synchronous motor in its pulley, or driven by flat or V-belt from a standard motor.

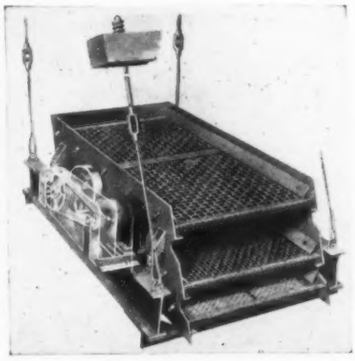
The Savings Effected with this crusher are astounding:

In cost of Maintenance.....80%
In Power.....The entire cost of crusher and motor in pulley is amortized annually.

Sieving test on glacial gravel crushed at the rate of 18 tons per hour, with No. 19 crusher set to ⅛ in., and using less than 15 hp., follows:

Minus ⅜ in.	100%
Plus 3 mesh	21½%
Minus 3—Plus 4	17%
Minus 4—Plus 14	36½%
Minus 14—Plus 48	15%
Minus 48—Plus 100	4%
Minus 100	5½%

KENNEDY VIBRATING SCREEN



Built in open or enclosed types, in widths ranging from 3′ to 6′ with one or more decks. It can be suspended, or supported from the bottom.

Suitable for scalping oversize from primary crushers, as well as smaller sizes, and chemical products.

The entire screening surface is effective, thereby insuring greatest capacity.

Equipped with self-aligning main bearings which account for low power consumption and also for long life of bearings.

Screen drive shaft is positioned near the feed end for balancing purposes and is patented.

Write today for our Catalog No. 16-P-735

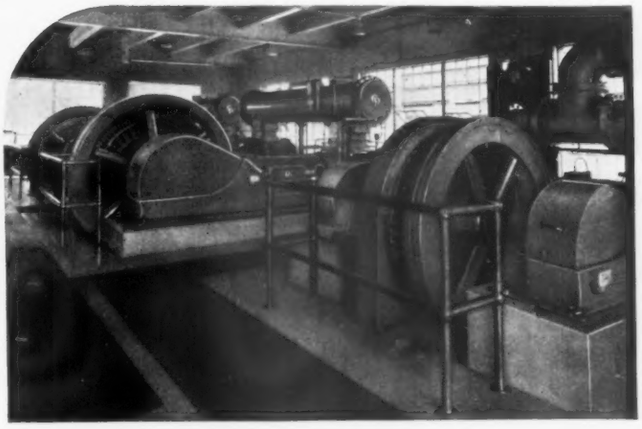
KENNEDY-VAN SAUN MFG. & ENG. CORP.

2 Park Avenue — New York, N. Y.

BRANCH OFFICES:—Chicago: 120 South La Salle St. Birmingham, Ala: 1408 South 22nd St. Seattle, Wash.: 3829 Roosevelt Way. Denver, Colo.: 1744 Glenarm Place. San Francisco, Calif.: 1135 Mission St. Los Angeles, Calif.: 416 South Spring St. London, England: Bush House. Paris, France: 40 Rue des Mathurins. Johannesburg, S. Africa: 73 Cullinan Bldg. Canadian Agents: The William Kennedy & Sons, Ltd., Owen Sound, Ont. Australian Agents: Walkers Limited, Maryborough, Queensland. New Zealand Agents: Booth, MacDonald & Co., Ltd., Christchurch.

CP STATIONARY AIR OR GAS COMPRESSORS

Single and two-stage designs; belt, direct-connected motor and steam drive; capacities up to 10,000 c.f.m.; special sizes also available.



"repeat" orders prove merit

Originally . . . two CP 2200 c.f.m., 400 hp. motor-driven Gas Compressors. Later . . . a "repeat" order for another of these, the third of the trio shown above. Recently . . . still another "repeat" for the same class and capacity machine. Four now, where three were before . . . and with eight additional CP Compressors in other plants of this prominent gas company, with whom compressor reliability is an absolute necessity . . . twelve in all!

Let us show you why one CP Compressor invariably sells the next one!

CHICAGO PNEUMATIC TOOL COMPANY

Sales and Service Branches All Over the World

6 EAST 44th STREET • NEW YORK, N. Y.

AIR & GAS COMPRESSORS • ROCK DRILLS
DIAMOND CORE DRILLS • DIESEL ENGINES
ELECTRIC TOOLS • PNEUMATIC TOOLS
VACUUM PUMPS & CONDENSERS

CHICAGO PNEUMATIC

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Index to Advertisers on Page 72

Crushing Rolls
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bonnot Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.

Diesel Engines (See Engines—Diesel)

Dipper Parts
Pettibone Mulliken Co.

Dippers and Teeth (Power Shovel)
American Manganese Steel Co.
Pettibone Mulliken Co.

Doors (Iron)
Smith Wire & Iron Works, F. P.

Dragline Cableway Excavators
*Link-Belt Co.

Dragline Excavators
*Harnischfeger Corp.
*Lima Locomotive Works, Inc.
*Link-Belt Co.

Dredges
Hetherington & Berner, Inc.
*Morris Machine Works

Drilling Accessories
Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

Drilling Contractors
Hoffman Bros. Drilling Co.
Mott Core Drilling Co.
Pennsylvania Drilling Co.

Drills (Blast-Hole)
Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

Drills (Core)
Hoffman Bros. Drilling Co.
Mott Core Drilling Co.
Pennsylvania Drilling Co.

Drills (Diamond)
Chicago Pneumatic Tool Co.
Hoffman Bros. Drilling Co.
Mott Core Drilling Co.
Pennsylvania Drilling Co.

Drills (Rock)
Chicago Pneumatic Tool Co.
Gardner-Denver Co.
Worthington Pump & Machy. Corp.

Drill Sharpening Machinery
Gardner-Denver Co.

Drill Steel
Chicago Pneumatic Tool Co.

Drills (Well) (See Drills—Blast-Hole)

Drives (Multiple, Belt, Chain, Rope)
*Allis-Chalmers Mfg. Co
Worthington Pump & Machy. Corp.

Dryers
*Allis-Chalmers Mfg. Co.
Bonnot Co.
*Hardinge Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mch. Co.
McLanahan and Stone Corp.

Dust Arresters
Dracco Corp.
Ruemelin Mfg. Co.

Dust-Collecting Systems
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Dracco Corp.
Raymond Bros. Impact Pulv. Co.
Ruemelin Mfg. Co.

Dust Conveying Systems
*Allen-Sherman-Hoff Co.
Dracco Corp.
Fuller Co.
Ruemelin Mfg. Co.

Dust Handling Systems (Hydro Vacuum)
*Allen-Sherman-Hoff Co.

Dynamite (See Explosives)

Electrical Equipment
*Allis-Chalmers Mfg. Co.

Elevator Belting (See Belting)

Elevators (See Conveyors and Elevators)

Eliminators (Soft Stone) (See Soft Stone Eliminators)

Engineers
*Allis-Chalmers Mfg. Co.
Bonnot Co.
Fuller Co.
Hetherington & Berner, Inc.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
Ruemelin Mfg. Co.
*Smidth & Co., F. L.
Sprout, Waldron & Co.

Engine Generator Sets
See Generator Sets (Engine).

Engines (Diesel)
Chicago Pneumatic Tool Co.
Cummins Engine Co.
Nordberg Mfg. Co.
Worthington Pump & Machy. Corp.

Engines (Internal-Combustion)
Cummins Engine Co.
Nordberg Mfg. Co.
Worthington Pump & Machy. Corp.

Engines (Steam)
*Morris Machine Works
Nordberg Mfg. Co.

Excavating Machinery (See Shovels; Cranes; Buckets; etc.)

Excavators—Shallow Grading (Bucket Elevator Type)
Haiss Mfg. Co., Geo.

Fans (Exhaust)
*Kennedy-Van Saun Mfg. and Eng. Corp.

Feeders
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Bonnot Co.
Fuller Co.
*Hardinge Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
Morrow Mfg. Co.
*Pioneer Gravel Equip. Mfg. Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.

Feed Water Heaters
Worthington Pump & Machy. Corp.

Fencing (Woven Wire)
*American Steel & Wire Co.
Smith Wire & Iron Works, F. P.

Fire Escapes
Smith Wire & Iron Works, F. P.

Floor Sweeping Systems (Hydro Vacuum)
*Allen-Sherman-Hoff Co.

Forges (Oil)
Gardner-Denver Co.

Fuses (Detonating)
*Ensign-Bickford Co.

Gaskets
Goodyear Tire & Rubber Co.
Republic Rubber Co.

Gasoline Engines (See Engines—Internal-Combustion)

Gates (Bin) (See Bin Gates)

Gates (Clamshell)
Haiss Mfg. Co., Geo.
*Link-Belt Co.

Gears (Herringbone)
*Link-Belt Co.
Sprout, Waldron & Co.

Gears and Pinions
Haiss Mfg. Co., Geo.
*Link-Belt Co.
Pettibone Mulliken Co.
Sprout, Waldron & Co.

Gelatin (See Explosives)

Generators (See Motors and Generators)

Glass Sand Equipment
Lewistown Foundry & Machine Co.

Grab Buckets (See Buckets—Clamshell, Orange - Peel, etc.)

Grating (Steel)
*Hendrick Mfg. Co.
Ryerson & Son, Joseph T.

Grinding Balls (See Balls, Grinding)

Grizzlies
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Eagle Iron Works
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdy. & Mach. Co.
Pettibone Mulliken Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Universal Road Machy. Co.

Guards (Wire)
Smith Wire & Iron Works, F. P.

Guns (Hydraulic)
Hetherington & Berner, Inc.
Taylor Forge & Pipe Works

Hammer Mills (See Crushers—Hammer)

Hoists
Chicago Pneumatic Tool Co.
Gardner-Denver Co.
*Harnischfeger Corp.
Hetherington & Berner, Inc.
Iowa Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equip. Mfg. Co.
*Sauerman Bros., Inc.
Smith Engr. Works
Sprout, Waldron & Co.

Hoppers
*Hendrick Mfg. Co.
*Link-Belt Co.
Lippmann Engr. Works

Hose (Air, Steam and Water)
Chicago Pneumatic Tool Co.
Goodyear Tire & Rubber Co.
Republic Rubber Co.
United States Rubber Co.
Worthington Pump & Machy. Corp.

Hose (Radiator-Engine Cooling)
Goodyear Tire & Rubber Co.
Republic Rubber Co.
United States Rubber Co.

Hose Couplings (See Couplings)

Hydraulic Guns (See Guns—Hydraulic)

Idlers
American Manganese Steel Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.

Indicators (Bin)
Ripley Mfg. Co.

Kilns and Coolers (Rotary)
*Allis-Chalmers Mfg. Co.
Bonnot Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Smidth & Co., F. L.

Kilns (Vertical)
*Hardinge Co.

Kominuters
*Smidth & Co., F. L.

Lime-Handling Equipment
Fuller Co.
*Hardinge Co.
Iowa Mfg. Co.
*Link-Belt Co.
Raymond Bros. Impact Pulv. Co.
*Robins Conveying Belt Co.

Lime and Hydrating Plants
*Hardinge Co.

Lime Kilns
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Linings (Ball- and Tube-Mill) (See Mill Liners and Linings)

Loaders and Unloaders
Fuller Co.
Haiss Mfg. Co., Geo.
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.

Locomotives (Electric, Gas and Steam)
*Lima Locomotive Works

Magnetic Pulleys (See Pulleys, Magnetic)

Manganese Steel
American Manganese Steel Co.
Pettibone Mulliken Co.
Ryerson & Son, Joseph T.

Manganese Steel (Plates and Sheets)
American Manganese Steel Co.
Pettibone Mulliken Co.
Ryerson & Son, Joseph T.

Mechanical Rubber Goods
Goodyear Tire & Rubber Co.
Republic Rubber Co.
United States Rubber Co.

Mill Liners and Linings
American Manganese Steel Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Smidth & Co., F. L.

Mills (Grinding) (See also Crushers—Hammer)
*Allis-Chalmers Mfg. Co.
Bonnot Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Fdy. & Mch. Co.
Raymond Bros. Impact Pulv. Co.
*Smidth & Co., F. L.
Sprout, Waldron & Co.

Motors and Generators
*Allis-Chalmers Mfg. Co.
*Harnischfeger Corp.

Motors (Internal-Combustion) (See Engines — Internal-Combustion)

Nails
*American Steel & Wire Co.
Ryerson & Son, Joseph T.

Netting (Locomotive Stack)
Smith Wire & Iron Works, F. P.

Nozzles (Gravel Washing)
*Deister Concentrator Co.

Nozzles (Hydraulic) (See Guns—Hydraulic)

Nozzles (Spray)
*Deister Concentrator Co.

Packings
Goodyear Tire and Rubber Co.
Republic Rubber Co.

Partitions (Wire)
Smith Wire & Iron Works, F. P.

Paving Mixers
Jaeger Machine Co.

Perforated Metal Plates
*Allis-Chalmers Mfg. Co.
Chicago Perforating Co.
*Hendrick Mfg. Co.
Morrow Mfg. Co.
Ryerson & Son, Joseph T.
Sprout, Waldron & Co.
*Wickwire Spencer Steel Co.

Pipe, Dredge (Floating and Shore)
Taylor Forge & Pipe Works

Pipe Flanges
Hetherington & Berner, Inc.
Ryerson & Son, Joseph T.
Taylor Forge & Pipe Works

Plug Valves (See Valves)

Pneumatic Drills (See Drills, Rock)

Portable Conveyors
Fuller Co.
Haiss Mfg. Co., Geo.
Iowa Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.

*** See also information in the 1935 Pit and Quarry HANDBOOK.**

BALANCED PERFORMANCE

Greater drilling capacity, with low air consumption and low maintenance costs to get more work done at less expense.

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Smooth operation prevents operator fatigue . . . drill easy to handle in any position, and under any conditions.

POWERFUL ROTATION

Powerful, 4-pawl rifle bar rotation . . . exceptionally strong blowing capacity for clean holes.

MONEY-SAVING

Efficient force-feed lubrication, entirely new in rock drills. Renewable chuck liner and front cylinder bushing. Improved gooseneck swivel air connection for longer hose life. Tough in every part.

GARDNER-DENVER

S-55 SINKER

THE MOST POPULAR 55-POUND DRILL ON THE MARKET

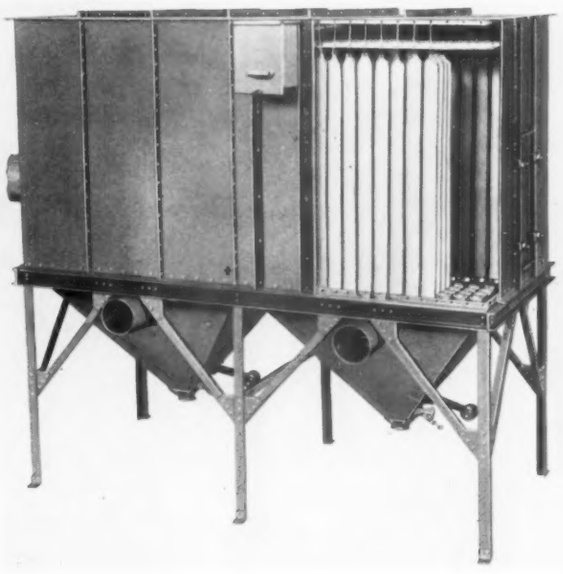
GARDNER-DENVER COMPANY
SINCE 1859
102 WILLIAMSON STREET QUINCY, ILLINOIS

GARDNER-DENVER
MAKES AIR DO MORE AND COST LESS

Dust

is a Public Enemy

and should be outlawed by every plant owner who knows that dustless operation means profitable operation. Proper dust control not only removes a health menace, but also increases the working efficiency of the men by providing pure air free from dust. It saves maintenance expense on motors, bearings and other machinery by preventing the abrasive wear from fine grit. Valuable dusts may be recovered with suitable filters instead of wastefully venting them.



RUEMELIN DUST FILTER

is the practical and economical answer to the dust problem. This is a tubular cloth bag type of filter, pioneered and perfected by Ruemelin engineers to overcome the objections of excessive wear, unwieldy size, inefficiency and inaccessibility, common to so many other existing filters. It cleans the air of not only the heavy dust particles, as captured by cyclone type collectors, but also the superfine dust which ordinarily escapes.

Ruemelin Dust Filters are low in first cost, inexpensive to maintain, and easy to install. Used for taking dust from hoppers, elevators, conveyors, pulverizing and screening equipment. Tell us your requirements, and we will send you information showing how Ruemelin Filters may be applied to your dust problem.

RUEMELIN MANUFACTURING CO.
3862 North Palmer Street Milwaukee, Wisconsin

Classified Buyers' Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Index to Advertisers on Page 72

Portable Crushing and Screening Plants
Iowa Mfg. Co.
*Pioneer Gravel Equip. Mfg. Co.

Portable Engines (See Engines—Internal Combustion)

Portable Loaders (See Loaders and Unloaders)

Power Cables (Rubber Clad)
*American Steel & Wire Co.

Power Shovels (See Shovels, Electric, Internal-Combustion and Steam)

Pulleys (Magnetic)
Sprout, Waldron & Co.

Pulleys (Wing)
Sprout, Waldron & Co.

Pulverized Fuel Systems
Gay, Rubert M.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Raymond Bros. Impact Pulv. Co.
Universal Road Machy. Co.

Pulverizers (See also Crushers; Mills; etc.)
Bonnot Co.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Foundry & Machinery Co.
New Holland Machine Co.
Raymond Bros. Impact Pulv. Co.
*Smidth & Co., F. L.

Pump Valves (See Valves Pump)

Pumps (Air-Lift)
Chicago Pneumatic Tool Co.
Fuller Co.

Pumps (Bulk Cement)
Fuller Co.

Pumps (Cement Slurry)
*Allen-Sherman-Hoff Co.
*Morris Machine Works
*Smidth & Co., F. L.

Pumps (Centrifugal)
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Hetherington & Berner, Inc.
*Morris Machine Works
Pettibone Mulliken Co.
Worthington Pump & Machy. Corp.

Pumps (Dredging)
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Hetherington & Berner, Inc.
*Morris Machine Works
Pettibone Mulliken Co.
Worthington Pump & Machy Corp.

Pumps (Sand and Gravel)
*Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Hetherington & Berner, Inc.
*Morris Machine Works
Pettibone Mulliken Co.

Pumps (Sump)
Chicago Pneumatic Tool Co.

Pumps (Vacuum)
Chicago Pneumatic Tool Co.
Fuller Co.

Rock Drills (See Drills—Rock)

Rod Mills
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

Rods (Welding)
American Manganese Steel Co.
McLean Welded Products Corp.
Ryerson & Son, Joseph T.

Roofing and Siding (Steel)
Ryerson & Son, Joseph T.

Rope (Wire) (See Wire Rope)

Sand Blast Equipment
Ruemelin Mfg. Co.

Sand Separators
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equip. Mfg. Co.
Smith Engr. Works

Sand—Lime—Brick Machinery
*Hardinge Co.

Sand-Settling Tanks
Iowa Mfg. Co.
*Link-Belt Co.
*Pioneer Gravel Equip. Mfg. Co.
Smith Engr. Works

Scrapers (Power Drag)
Iowa Mfg. Co.
*Link-Belt Co.
*Pioneer Gravel Equip. Mfg. Co.
*Sauerman Bros., Inc.

Screens
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
*Deister Concentrator Co.
*Deister Machine Co.
*Eagle Iron Works
Gay, Rubert M.
Haiss Mfg. Co., Geo.
*Hardinge Co.
*Hendrick Mfg. Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Morrow Mfg. Co.
Nordberg Mfg. Co.
*Pioneer Gravel Equip. Mfg. Co.
*Productive Equip. Corp.
*Robins Conveying Belt Co.
*Roebling's Sons Co., John A.
Smith Engr. Works
Smith Wire & Iron Works, F. P.
Sprout, Waldron & Co.
Universal Road Machy. Co.
*Wickwire Spencer Steel Co.

Screens (Vibrating or Shaking)
*Allis-Chalmers Mfg. Co.
*Deister Concentrator Co.
*Deister Machine Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
*Pioneer Gravel Equip. Mfg. Co.
*Productive Equip. Corp.
*Robins Conveying Belt Co.
Smith Engr. Works
Sprout, Waldron & Co.

Scrubbers
Knickerbocker Co.

Separators (Air) (See Air Separators)

Separators (Slurry)
*Smidth & Co., F. L.

Sheaves
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Eagle Iron Works
Haiss Mfg. Co., Geo.
Hetherington & Berner, Inc.
*Link-Belt Co.
McLanahan and Stone Corp.
Pettibone Mulliken Co.
Sprout, Waldron & Co.

Shovels (Electric, Internal Combustion and Steam)
*Harnischfeger Corp.
*Lima Locomotive Works, Inc.
*Link-Belt Co.

Silos
*Smidth & Co., F. L.

Skip Hoists and Skips
*Allis-Chalmers Mfg. Co.
Hetherington & Berner, Inc.
*Link-Belt Co.
*Robins Conveying Belt Co.

Soft Stone Eliminators
Knickerbocker Co.

Speed Reduction Units
Iowa Mfg. Co.
*Link-Belt Co.

Spouts (See Chutes and Chute Liners)

Sprays
*Deister Concentrator Co.

Sprockets and Chain
American Manganese Steel Co.
Iowa Mfg. Co.
*Link-Belt Co.
Pettibone Mulliken Co.
Sprout, Waldron & Co.

Stairs (Iron)
Smith Wire & Iron Works, F. P.

Stairs (Mine)
Smith Wire & Iron Works, F. P.

Steel (Alloy)
(See Alloys—Steel)

Steel (Abrasion Resisting)
Ryerson & Son, Joseph T.

Steel (Bars, Shapes, Plates, etc.)
Ryerson & Son, Joseph T.

Steel Grating (See Grating, Steel)

Steel Inclines (See Inclines, Steel)

Steel Plate Construction
*Hendrick Mfg. Co.
Hetherington & Berner, Inc.
Sprout, Waldron & Co.

Storage Equipment
Haiss Mfg. Co., Geo.
*Link-Belt Co.
*Sauerman Bros., Inc.

Sweeping Systems
*Allen-Sherman-Hoff Co.

Tanks
*Hendrick Mfg. Co.
*Link-Belt Co.

Tanks (Sand-Settling)
Iowa Mfg. Co.
*Link-Belt Co.
Morrow Mfg. Co
*Pioneer Gravel Equip. Mfg. Co.
Smith Engr. Works

Testing Sieves and Shakers
*Hendrick Mfg. Co.

Thickeners (Slurry)
*Hardinge Co.

Tire Repair Materials
Goodyear Tire & Rubber Co.
United States Rubber Co.

Tires (Truck, Passenger Cars, Tractor)
Goodyear Tire & Rubber Co.
United States Rubber Co.

Tools (Drill) (See Drilling Accessories)

Track Equipment
Pettibone Mulliken Co.

Track Shifters
Nordberg Mfg. Co.

Tractors
*Allis-Chalmers Mfg. Co.

Tramways (Aerial)
*American Steel & Wire Co.
*Roebling's Sons Co., John A.

Transformers
*Allis-Chalmers Mfg. Co.

Transmission Belting (See Belting)

Transmission Machinery
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
*Link-Belt Co.

Trippers
*Link-Belt Co.
*Robins Conveying Belt Co.

Truck Cranes (See Cranes)

Truck Mixers
Jaeger Machine Co.

Trucks and Trailers (See Motor Trucks)

Tube-Mills (See Mills—Ball, Tube, etc.)

Tubes (For Tire Casing)
Goodyear Tire & Rubber Co.
United States Rubber Co.

Underground Loaders
*Allis-Chalmers Mfg. Co.

Unloaders (Box Car)
Fuller Co.
*Link-Belt Co.

Valves (Air)
Worthington Pump & Machy. Corp.

Valves (Pump)
Taylor Forge & Pipe Works

Variable Speed Reducers or Transmissions
*Link-Belt Co.

Vibrating Screen Plate
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Link-Belt Co.
Morrow Mfg. Co.

Vibrating Screens (See Screens—Vibrating)

Wagons (Dump)
Le Tourneau, Inc., R. G.

Washers (Sand, Gravel and Stone)
*Allis-Chalmers Mfg. Co.
*Eagle Iron Works
Haiss Mfg. Co., Geo.
*Hardinge Co.
Iowa Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Knickerbocker Co.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Pioneer Gravel Equip. Mfg. Co.
*Smidth & Co., F. L.
Smith Engr. Works
Universal Road Machy. Co.

Welding & Cutting Equipment
McLean Welded Products Corp.
Ryerson & Son, Joseph T.

Welding Supplies
American Manganese Steel Co.
*American Steel & Wire Co.
McLean Welded Products Corp.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.
*Wickwire Spencer Steel Co.

Well Drills (See Drills—Well)

Wheels (Car)
American Manganese Steel Co.
*Eagle Iron Works
Iowa Mfg. Co.
Pettibone Mulliken Co.

Wheel Rims. See Rims—Wheel

Winches and Capstans
*Link-Belt Co.
*Robins Conveying Belt Co.
Sprout, Waldron & Co.

Wire & Cable (Electric)
*American Steel & Wire Co.
*Roebling's Sons Co., John A.

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*Robins Conveying Belt Co.
*Roebling's Sons Co., John A.
Smith Wire & Iron Works, F. P.
*Wickwire Spencer Steel Co.

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*American Steel & Wire Co.
Hazard Wire Rope Co.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.
*Wickwire Spencer Steel Co.
Williamsport Wire Rope Co.

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*American Steel & Wire Co.
Hazard Wire Rope Co.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.
*Wickwire Spencer Steel Co.
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Wire Rope Slings
*American Steel & Wire Co.
Hazard Wire Rope Co.
*Roebling's Sons Co., John A.
*Wickwire Spencer Steel Co.
Williamsport Wire Rope Co.

Wire (Welding)
*American Steel & Wire Co.
McLean Welded Products Corp.
*Roebling's Sons Co., John A.
Ryerson & Son, Joseph T.
*Wickwire Spencer Steel Co.

Worm Gears (See Gears and Pinions)

*** See also information in the 1935 Pit and Quarry HANDBOOK.**

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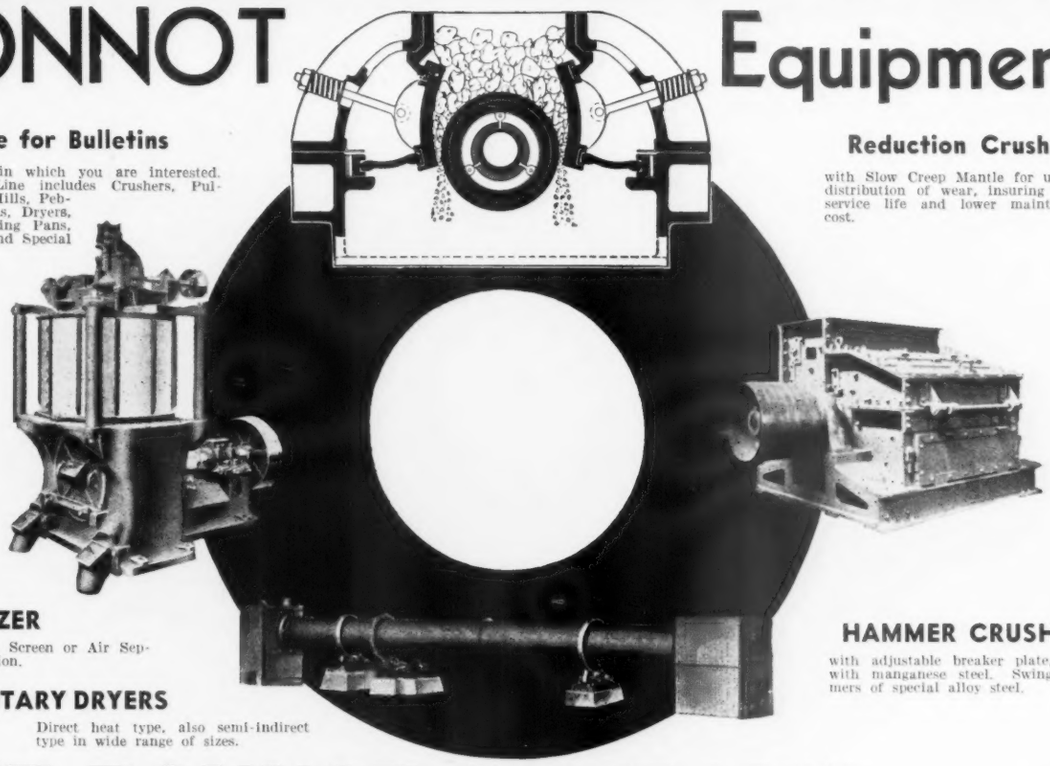
of machinery in which you are interested. The Bonnot Line includes Crushers, Pulverizers, Ball Mills, Pebble Mills, Kilns, Dryers, Feeders, Grinding Pans, Wet or Dry, and Special Units.

Reduction Crusher

with Slow Creep Mantle for uniform distribution of wear, insuring longer service life and lower maintenance cost.



PULVERIZER

with Screen or Air Separation.

ROTARY DRYERS

Direct heat type, also semi-indirect type in wide range of sizes.

HAMMER CRUSHER

with adjustable breaker plate, faced with manganese steel. Swing hammers of special alloy steel.

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CANTON, OHIO

—Since 1891—

New York Office
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Saved Costly Shutdowns

It would have cost many hundreds of dollars to replace the worn parts of this huge No. 24 gyratory crusher, besides the cost of the necessary shutdown—but McLean rebuilt the crusher head with **work-hardened** nickel-manganese steel at a fraction of that cost and gave the owners, Moulding-Brownell Corp., a surface that will outlast the original several times over.

This job was done right in the field, eliminating the expense of rehandling, and preventing a long and costly interruption of the crushing work. For the crusher worked all day and the welders all night; that is the McLean method in installations of this kind. No less than 1200 pounds of welding material was used on this job alone.

McLean offers you this economical service in rebuilding your worn-out castings, such as dipper teeth, crusher heads and gears, pulverizer hammers, etc. Ship them to us, or we'll come to you—whichever is convenient for you.

The extra wear-life you get from castings rebuilt by the McLean process is due to the method of *work-hardening* the built-up portion before applying the hard surfacing, which insures a tough base metal that will not crack or chip.

Send for Bulletin—and ask about our special offer on rebuilding dipper teeth at less cost, including freight, than a set of new ones.

McLean Welded Products Corp.

WELDING ENGINEERS AND CONTRACTORS

530-32 WEST 79th STREET, CHICAGO, ILLINOIS

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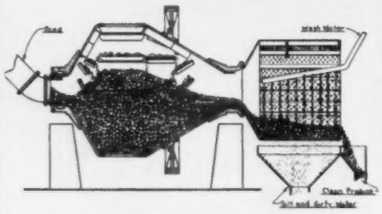
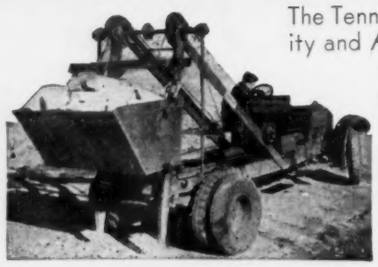
SCRUBBERS



The Scrubber that cleans and scrubs under pressure by mass contact. Uses no internal moving parts to cause high maintenance. Write for Bulletin No. 37.

HARDINGE COMPANY
INCORPORATED
YORK, PA.—Main Office & Works Chicago—205 W. Wacker Drive
New York—122 E. 42nd St. San Francisco—444 Market St.

DEMPSTER BUCKET DUMP



The Tennessee Valley Authority and Arundel Corporation of Baltimore reduced quarry hauling and loading costs with the **DEMPSTER BUCKET DUMP.** One unit handles 6 to 10 detachable buckets.

Exclusive dealers wanted

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ROEBLING
Wire Rope

Wire · Wire Rope · Welding Wire · Flat Wire · Bare and Insulated Wires and Cables · Wire Netting and Cloth.
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Branches in JAR *Principal Cities*

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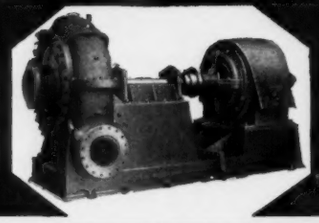
CENTRIFUGAL PUMPS



For handling sand, gravel, slurry, or clear water. Special designs and materials for each service. Also Hydraulic Dredges for sand and gravel production, deepening or enlarging lakes, reservoirs, waterways, etc.

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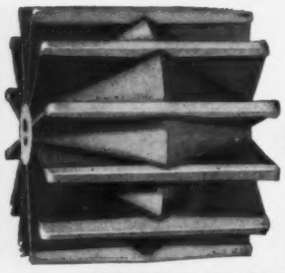
MORRIS MACHINE WORKS
Baldwinsville, N. Y.

MORRIS MACHINE WORKS · BALDWINSVILLE, N.Y.

SAVE YOUR CONVEYOR and Elevator Belts *with* SPROUT-WALDRON Wing Pulleys



Interchangeable with standard pulleys. Nothing can lodge between belt and pulley.

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Elevating, Conveying and Transmission Equipment

Lewistown Foundry Products ARE Performance-Tested

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REVOLVING SCREENS
CRUSHERS DRY PANS

Lewistown Foundry & Machine Co.
Lewistown, Pa.

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are popular in the quarry fields. They wear well. Full range of sizes

Heat-Treated Double-Corrugated Plates

with square, round and "Sqround" perforations. Write for data, particularly on the new "Sqround" Mesh.

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SHOVELS-CRANES-CLAMSHELLS-DRAGLINES
3-4 yd., 1 yd., 1 1-4 yd., 1 1-2 yd., 1 3-4 yd. & 2 yd
(A TYPE AND SIZE FOR EVERY JOB)

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SHOVEL AND CRANE DIVISION
Lima, Ohio, U. S. A.

New!

More Capacity!

Lower Costs!

Positive Uniformity!

Greater Efficiency!

The capacity of grinding mills is materially increased by this new Gayco Centrifugal Air Separator. Fines are removed as they are made.

It delivers an absolutely uniform product of any fineness desired from 60 to 400 mesh with greater capacity and lower power cost than is possible with any other type of air separator.

It is slow speed, requiring very little power. Repair costs are practically nothing—the only wearing parts are the steel cut gears and bearings enclosed in a dust proof casing.

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Division, Universal Road Machinery Company

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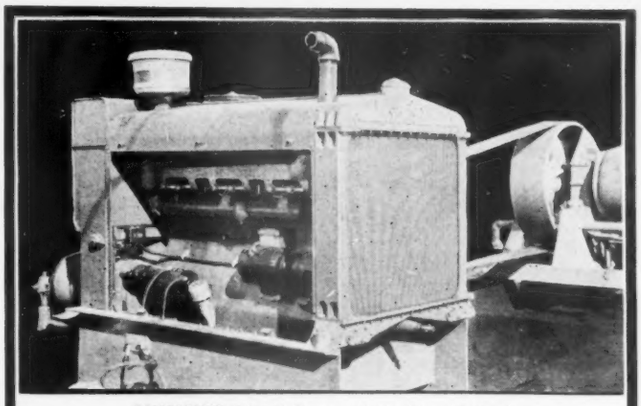
Crushing, Screening, Washing

equipment—Reliance—in capacities from 50 to 1500 tons per day. Built with simplicity of design for long hard service with low maintenance costs. Send for catalog and full information.

Universal Road Machinery Co.

Kingston, N. Y.



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Replace gasoline engines with

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for superior power performance —with amazing economy

For portable power—stationary power—and motor truck service—CUMMINS DIESELS deliver maximum power at minimum cost. Sizes from 35 to 400 H.P.

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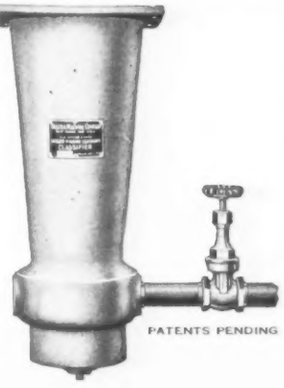
The Leader in Diesel Engineering Advancement

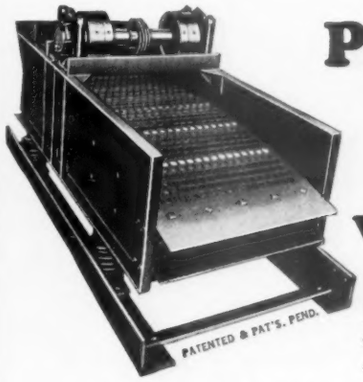
SALES AND SERVICE FROM COAST TO COAST

COMPOUND FUNNEL CLASSIFIER

For sizing minus 5/16" gravel and sand, and for cleaning it by washing out silt and other light impurities.

Descriptive Bulletin No. 23





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Improved Heavy Duty

VIBRATING SCREEN

Built in all standard sizes and in from one to three decks.

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1933 EAST WAYNE STREET FT. WAYNE, IND.

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and their accessories

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Stronger gauge for gauge than any other type. Light weight. Low initial cost. Easy to handle or move. Stout and rigid. Smooth, full-flow interior. Available in steel or Armco Ingot Iron. Write for Catalog.

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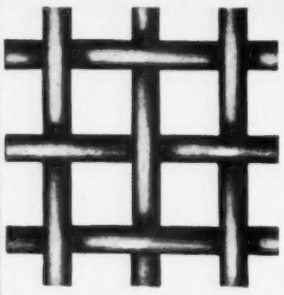
Ryerson Abrasion Resisting Sheets and Plates Last Longer

This new type of steel resists wear many times longer than ordinary steel. Write for complete data—also stock list showing steel of every kind, shape, and size. Immediate shipment assured. Joseph T. Ryerson & Son, Inc., Chicago, Cincinnati, Milwaukee, Boston, Detroit, Philadelphia, Cleveland, Buffalo, St. Louis, Jersey City.

RYERSON STEEL



DURO SCREENS

Tough and Economical

Made of a special Spring Steel Wire to resist extreme abrasion and withstand severe vibration.

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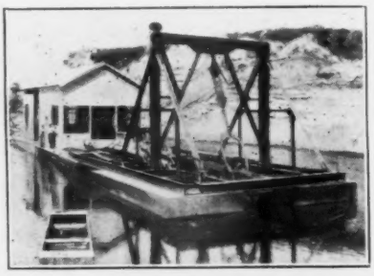
ESTABLISHED 1884

F. P. SMITH WIRE AND IRON WORKS

Clybourn, Fullerton and Ashland Aves. and Chester St., CHICAGO

EAGLE SWINTEK SCREEN NOZZLE LADDER LOWER YOUR COST



Will eliminate stoppages and slug pumping — insuring an even, constant feed of solids to the suction nozzle — with less power — greatly decreasing the cost per yard of material produced.

Write for descriptive literature and let us tell you how this can be done with your dredge.

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Des Moines, Iowa

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HYDROSEAL DREDGE PUMP

Unique principle of hydrosealing both sides of the impeller against abrasive wear, cuts maintenance to a fraction and saves ⅓ in power costs in pumping sand, gravel, rock and other abrasive materials—Estimated economies guaranteed. Sizes 2" to 22", pulley or motor drive. Descriptive Catalog sent on request.

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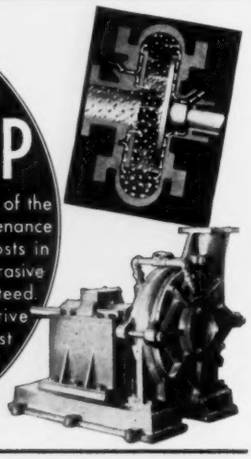

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Pit and Quarry
with which is consolidated
CEMENT-MILL & QUARRY

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ALL materials, fine or coarse, light or heavy . . . clay, gravel, sand, ores, stone, etc. . . . yield to the wizardry of the mechanically-vibrated, Link-Belt Vibrating Screen, and classify themselves in strict accordance with their size. Its uniform vibration keeps the meshes open, and makes the screen's entire screening surface 100% effective. Send for Book No. 1462.

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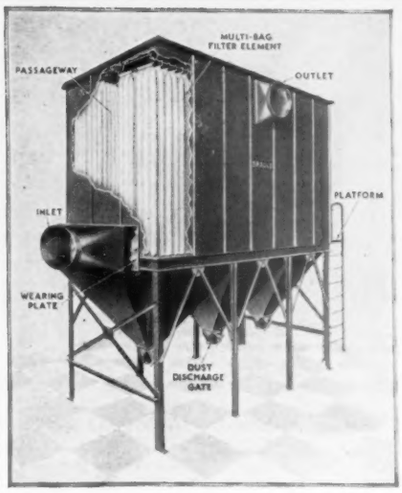
LINK-BELT COMPANY 5366

PHILADELPHIA CHICAGO INDIANAPOLIS
ATLANTA SAN FRANCISCO TORONTO

Offices in Principal Cities

DUST *cost you* MONEY



control DUST *with the* DRACCO MULTI-BAG FILTER

DUST in any plant is an EXPENSE. The facts are that Dust costs you money in MANY ways. Your men work better and equipment lasts longer where Dust is Controlled and there are fewer law suits.

LET US REDUCE YOUR DUST HAZARD

It doesn't pay to shut your eyes to your Dust problems because EACH DAY it takes its toll by reducing plant efficiency and in addition it greatly increases maintenance cost. With the New DRACCO MULTI-BAG FILTER you can ECONOMICALLY and EFFICIENTLY Control Dust,—initial and maintenance costs are low and most installations will soon pay for themselves. For over 20 years we have been solving Dust Control problems and invite you to share the benefit of our many years experience.

DRACCO CORPORATION
Successors to The Dust Recovering & Conveying Co.
4077 E. 116th St. Cleveland, Ohio

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FLEXCO HD

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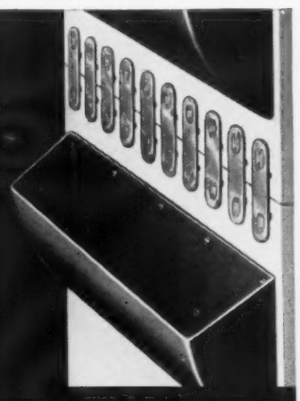
BELT FASTENERS *for* ELEVATORS *and* CONVEYORS



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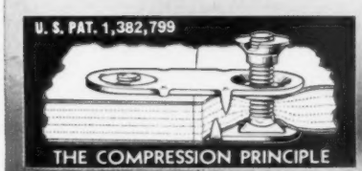

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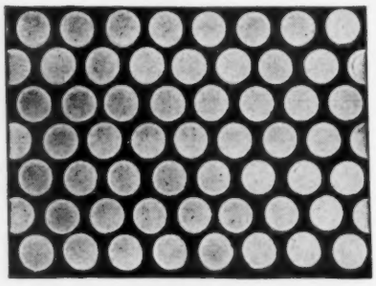

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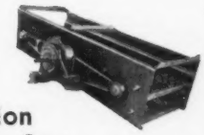

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Capacity	¼-yard
Engine	Ford V-8 (40 HP)
Weight (as shovel)	15,600 lbs.
Crowding Motion	P&H Rapid Reversing
Clutches	Split Second Control
Swing Clutches	Internal Expanding
Swing Line Speed	162 F.P.M.
Hoist Speed	170 F.P.M.
Dragline Speed	3 RPM
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Travel Speed	7 Feet
Tail Swing	10 Feet 4 inches
Height to Top of Cab	

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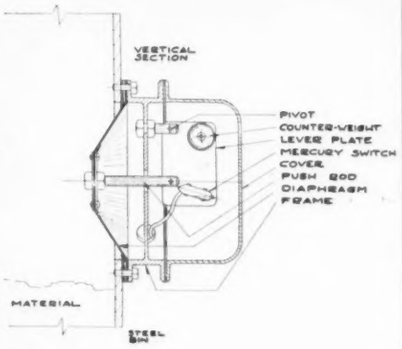
for Automatically Controlling and Indicating Level of Bulk Materials in Bins

Assures New Economies in Plant Operation



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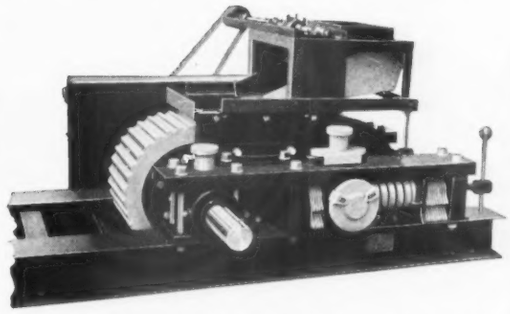

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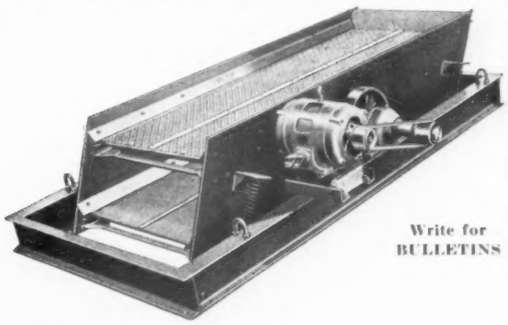

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30" McCully Gyratory Crusher, 150 HP AC Motor.
10x20 Jaw Crusher, All Steel Frame, Mang. fitted, mounted on 4-Wheel Gooseneck Truck.
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No. 2 Williams Semi-Vulcanite Heavy Duty Hammer Mill.
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8 Ton Buffalo-Springfield Tandem Gasoline Roiler.
150 HP Fairbanks-Morse 6-Cylinder Diesel Engine.
½, ¾, 1, 1½, 2 Yd. Drag Scraper Outfits. Also extra Buckets.
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25-ton Browning 8-wheel, 50′ boom.
20-ton Industrial 8-wheel, 50′ boom.
15-ton Industrial 8-wheel, 45′ boom.
18-ton O&S 8-wheel, 45′ boom.

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5-yard WESTERN 36″ gauge heavy-duty (33 of these).
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All equipped with Code Boilers.

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1—36″x24″ Jeffrey type D Hammer Mill.
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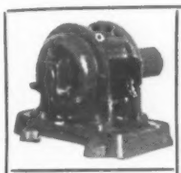

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250	F. M. sl. rg.	1200
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200	G. E. sl. rg.	900
150	G. E. sl. rg.	1750
150	West. sl. rg.	720
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Index to Advertisers

*Allen Sherman Hoff Co..... 64
*Allis-Chalmers Mfg. Co. 19
American Manganese Steel Co. 7
American Steel & Wire Co. ... 6

Birmingham Rail & Locomotive Co. 69
Bonnot Co. 61
Broadcast Section 68-71
Burnham, Royal E. 70

Chicago Perforating Co. 66
Chicago Pneumatic Tool Co. .. 57
Cleveland Wire Cloth & Mfg. Co. 72
*Consolidated Products Co. 69
Cummins Engine Co. 63

*Deister Concentrator Co. 64
*Deister Machine Co. 63
Dempster Bros., Inc. 62
*Dixie Machy. Mfg. Co. 66
Dracco Corp. 65

Eagle Iron Works..... 64
*Ensign-Bickford Co. 10
Equipment Corporation of America 71

Flexible Steel Lacing Co. 65
Fuller Co. 13

Gardner-Denver Co. 59
Gay, Rubert M. 63
Goodyear Tire & Rubber Co... 3

Haiss Mfg. Co., Geo. 65
*Hardinge Co. 62
*Harnischfeger Corp. 67
Hazard Wire Rope Co. 4
*Hendrick Mfg. Co. 62
Hetherington & Berner, Inc. .. 72
Hoffman Bros. Drilling Co. .. 70

Industrial Plants Corp. 69
Iowa Mfg. Co. 17
Iron & Steel Products, Inc. ... 69

Jaeger Machine Co. ..Back Cover

*Kennedy-Van Saun Mfg. & Engr. Corp. 57
Knickerbocker Co. 55

Le Tourneau, Inc., R. G..... .....Inside Back Cover
Lewis, Harry C. 68
Lewistown Foundry and Machine Co. 62
*Lima Locomotive Works, Inc.. 62
*Link-Belt Co. 1-65

Machinery Sales Corp. 68
McLanahan & Stone Corp. ... 67
McLean Welded Products Corp. 61
*Morris Machine Works..... 62
Morrow Mfg. Co. 66
Mott Core Drilling Co. 70

National Industrial Advertisers Assn. 18
New Holland Machine Co. 67
Nordberg Mfg. Co. 16

Pennsylvania Drilling Co. 70
Pettibone Mulliken Co. 55
*Pioneer Gravel Equip. Mfg. Co. .....Inside Back Cover
*Productive Equipment Corp... 67

Raymond Bros. Impact Pulv. Co. 15
Republic Rubber Co. 5
Ripley Mfg. Co. 67
*Robins Conveying Belt Co. ... 64
*Roebling's Sons Co., John A... 62
Ruemelin Mfg. Co. 59
Ryerson & Son, Inc., Joseph T. 64

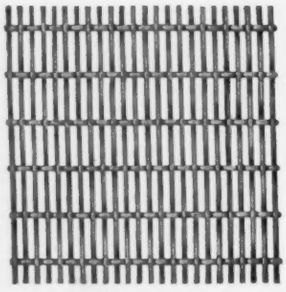
*Sauerman Bros., Inc. 66
*Smidth & Co., F. L....Front Cover
Smith Engr. Works..... 8
Smith Wire & Iron Works, F. P. 64
Sprout, Waldron & Co. 62
Stein-Brill Corp. 68

Taylor Forge & Pipe Works.. 64

United States Rubber Co. 9
Universal Road Machy. Co. ... 63

*Wickwire Spencer Steel Co.... 20
Williamsport Wire Rope Co... 14
Worthington Pump & Machy. Corp. 11

***See also information in the 1935 Pit and Quarry HANDBOOK**



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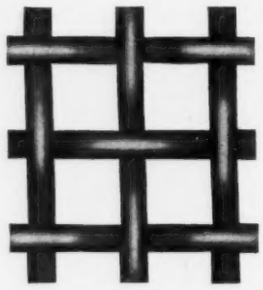

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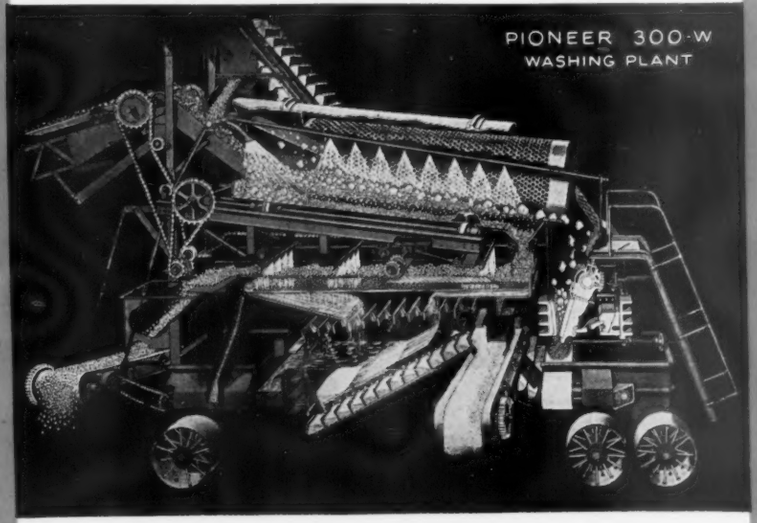

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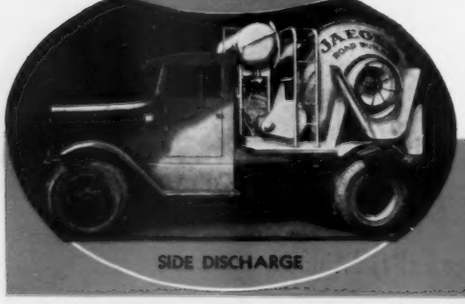

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